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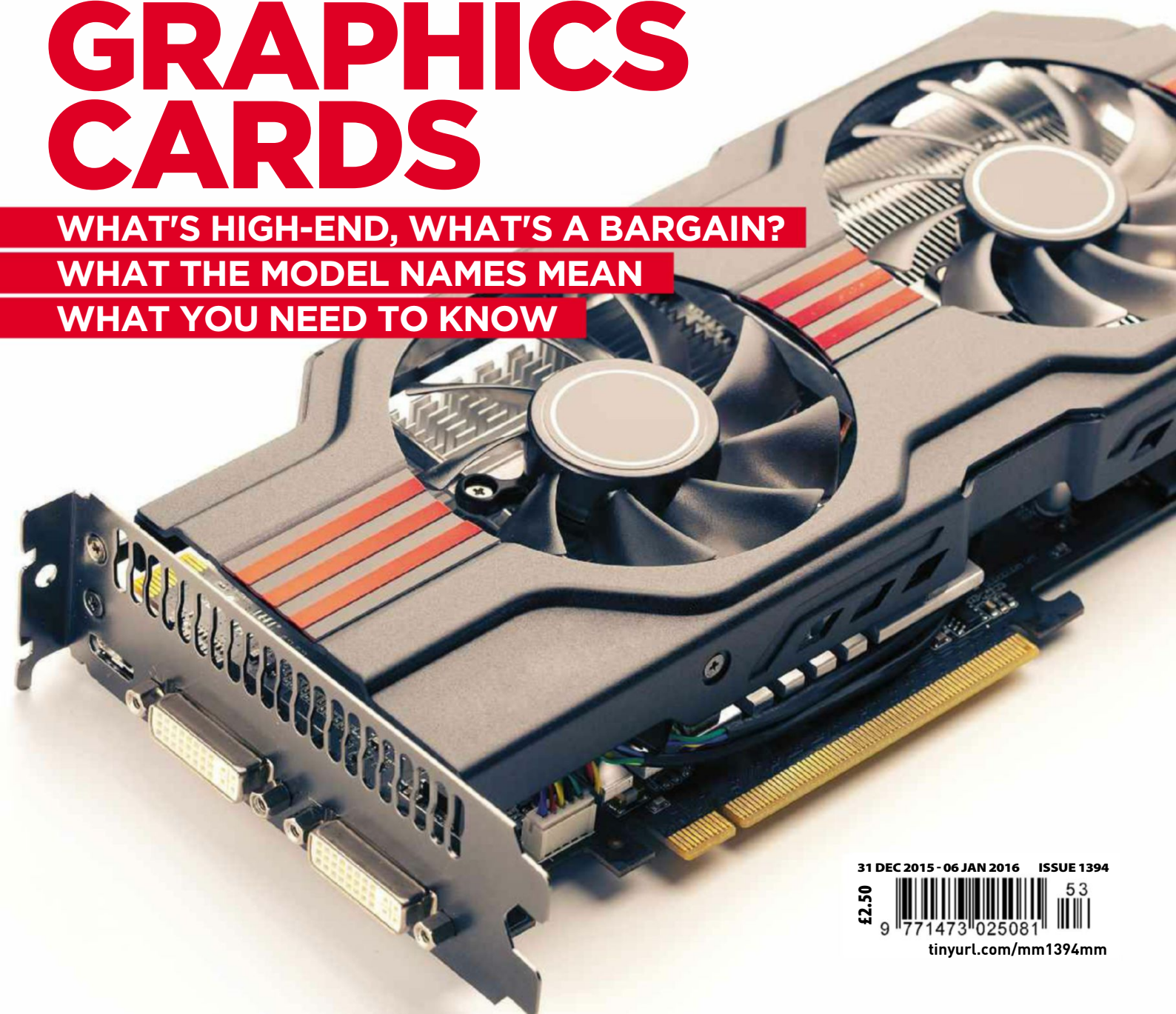
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08 Understanding Graphics Cards

Although graphics cards are often associated with PC gaming, you might also need to consider them for things like image editing and video playback too. What you don't necessarily need to do, however, is spend a lot of money. So how do you choose the right card for your needs. David Hayward looks at a few prime examples and explains what all the jargon means

18 20 Essential IT Tools

If you're working in IT or if you just take computing seriously, then certain equipment can make your life so much easier. Mark Pickavance, a man who's done more than his fair share of IT work, has picked out 20 things that you shouldn't be trying to live without

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Wouldn't it be nice to have a car that could drive you home after a night out, rather than you having to get a taxi or public transport? Of course, it would, and it's a dream that getting closer to reality all the time. But it's not without its problems, and there may well be certain obstacles that we'll never overcome

50 E-readers On Test

Over the last few years, e-readers have gone from being a niche technology to something that can probably be found in the majority of households in the UK. There are certain players that dominate the e-reader market, of course, but what of the plucky underdogs? We've been testing six readers that are available to buy right now

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50 E-readers On Test



60 Lesser Known Web Browsers

60 Lesser Known Web Browsers

The majority of the web-surfing world used to navigate their way around the web using Netscape, before they turned to Internet Explorer. In recent times, however, Google Chrome has been king. As Aaron Birch explains, though, there are plenty of less obvious names in the browser game and some of them are really worth checking out

64 Using Ubuntu Phone

It's been out for a while, but so far the Ubuntu Phone operating system has failed to take the world by storm. What better way to find out why that is than to spend some time using an Ubuntu Phone handset? That's just what Chris Salter has been doing, and he's here to tell us how he got on

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Understanding Graphics Cards

We try and get our heads around the complexities of the GPU

A fair few years ago, we were spoiled for choice when it came to picking a graphics card. Should we buy an ATI card, Voodoo Banshee, Matrox Millennium or a Savage S3? It could lead to some interesting, if a little confusing discussions.

These days there are the two main players left: AMD (formerly ATI) and Nvidia. But even though there are only two manufacturers now, it hasn't got any less confusing. Where we used to simply look for the make and the amount of memory the card had, now there's the GPU clock frequency, GPU shader clock, number of shaders and cores, memory type, memory bandwidth and TDP to take into consideration. And all that is before we even look to see if our case is big enough to fit the card in the first place.

The technical specification of a modern graphics card often give experts a headache, so for the layperson, who simply wants a card that will fit in their PC and run *Assassin's Creed: Syndicate* without too much of a problem, the long list of tiresome numbers can be quite bewildering.

Factor into all that what exactly a budget, mid-range and high-end card actually is and what it's capable of, and you can hardly blame people for simply turning to a console when it comes to gaming.

That said, we thought we'd try and put together something that can help to explain the various jargon associated with graphics cards. We'll look at some examples of budget, mid-range and high-end cards, and we'll see if we can come up with some examples

of what sort of cards you'll need for particular situations. All being well, you should have enough knowledge to be little less confused the next time you decide to shop for a graphics card.

Budget Cards

We'll start off with some examples of the price ranges, beginning of course with the budget range of graphics cards.

A budget graphics card is a fine balance of performance and cost; a little too much or too little either way, and you're either out of your price range or you've got something that's really not worth bothering with.

Nvidia

In our opinion, the best budget graphics card from the Nvidia camp is the GeForce GT 730. This is an exceptionally capable card, but before you go out and buy one, there are a couple of things we need to address first.

There are a number of GT 730 cards available. Some offer 1GB of GDDR3 memory, and others have 2GB; some are 128-bit, whereas others are 64-bit. They're more or less the same, in that the GPU used is an upgraded GT 630 model with a better memory bandwidth, but the specific GPU to look out for is the GK208 Kepler.

This is a better processor, and you'll usually find this GPU on the GDDR5 64-bit models, such as the Asus GT 730 2GB ([goo.gl/01Fgmb](#)) priced at around £58-60. This particular model has a



▲ The Asus GT 730: a good Nvidia budget graphics card

“ Even though there are only two manufacturers now, it hasn’t got any less confusing ”

902MHz core clock, a memory clock speed of 1250MHz and 384 CUDA cores with a TDP of around 35W.

It’s a single-slot card but manages to feature VGA, DVI and HDMI ports, which is ample for most users. In terms of gaming power, the GT 730 should achieve a 3DMark score of around 1,540, which translates to running most of the top games from last year (the likes of *Watch Dogs* and so on) at 1280 x 720 on medium graphical settings. You’ll need to make sure the other system specs are up to scratch, of course, but the GT 730 2GB should be a good baseline Nvidia card to work from.

AMD

One of the best AMD budget cards you can get is the Asus R7 250X 1GB GDDR5 (goo.gl/HghBXU), priced at around £67.

This Cape Verde GPU is an upgraded Radeon 7770 and has a 1000MHz GPU clock (over 5% more than the stock R7 250X) and a memory clock speed of 1125MHz. There are 640 shader units and it has a TDP of around 80W.

It’s a dual-slot card and one that features DVI, HDMI and DisplayPort. As for gaming power, you should expect to see a 3DMark score of around 2,600 with this particular model.

Since it’s a tad more powerful than the GT 730, the R7 250X will be able to run the same titles as previously mentioned but probably at a higher resolution with the graphical details still set to medium. Or you could opt for a lower 720 resolution but increase the detail slightly. Either way, it’s an excellent budget gaming card.

Mid Range

The cost of a mid-range card varies depending on who you talk to. We usually look at the £70 to £160 as mid-range, but others tend to take the price range all the way up to £250.

A mid-range card may seem like a pretty safe place to be, but it all depends on which rung of the ladder in the mid-range you are. If you look at a card that’s toward the bottom end of the scale, then it won’t be long until it’s classed as budget and struggling with the current games.

On the other hand, a card that’s toward the top end of the mid-range scale will last you a lot longer. Taking that into consideration, we’ll start some way into the mid-range price bracket.

Nvidia – Lower End

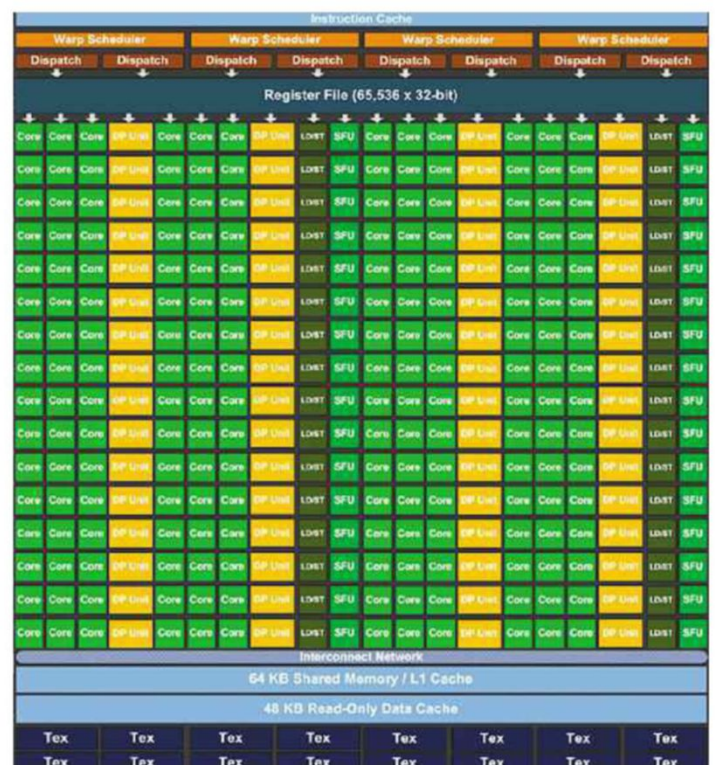
Starting at £100, we have the PNY GTX 750Ti with 2GB of GDDR5 memory (goo.gl/0SgoKN). This uses a GM107 GPU with a clock speed of 1020MHz, a boost clock of 1085MHz and a memory clock speed of 1350MHz. You’ll find 640 CUDA cores and a TDP of 62W on this dual-slot card, and as far connectivity goes, it has DVI, VGA and HDMI ports.

Performance is certainly good, with a 3DMark score of around 5,680. What this translates to is a surprisingly well-balanced gaming card. For example, we’ve had a GTX 750Ti 2GB with a 3.5GHz Intel i5-4690, 8GB of memory and Windows 10 running *Assassin’s Creed: Syndicate* on medium settings at 1920 x 100, and it was a playable 28fps with only a graphical hiccups here and there. Likewise, *Fallout 4* on the same system, with medium settings and at 1920 x 1080, managed a pretty impressive average of 27fps.

Considering it’s only £100, it’s a good graphics card for the money.

AMD – Lower End

The MSI R7 370 Gaming 2G is our mid-range AMD card of choice and one we’ve reviewed and scored highly in the past. For around £116 (goo.gl/5m3yml), this Trinidad GPU has a clock speed of 925MHz with a gaming boost of up to 1050MHz



▲ CUDA cores, shaders and stream processors: they all do pretty much the same thing



▲ The Asus R7 250X: a good AMD budget graphics card

(over 6% faster than the stock R7 370 GPU speed) and a memory clock speed of 1400MHz.

It has 1,024 shader units and a TDP of 110W, much higher than the aforementioned GTX 750Ti. It's a dual-slot card and features a pair of DVI ports, as well as HDMI and DisplayPort connections.

You can expect a 3DMark score of around 5,856 when running this card, which puts it slightly ahead of the GTX 750Ti, and will no doubt yield the same results, albeit with one or two extra in-game effects pushed to higher graphical setting.

“ If you plan to get the best possible gaming experience at much higher resolutions, well into the 4K region, then you're going to need to splash out for a high-end graphics card ”

Of course, it depends on whether you think the extra £16 is worth the 200 3DMark points or not.

Nvidia – Higher End

Toward the end of the mid-range scale, the Gigabyte GTX 960 OC 4GB GDDR5 graphics card (goo.gl/oDp0GQ) makes a pretty good choice at £160.

This GM206 GPU has a base clock speed of 1216MHz, which is more than 7% faster than the stock GTX 960. It has a boost clock 1279MHz with a memory clock speed of 1753MHz. It also features 1,024 CUDA cores and a TDP of 120W, with connectivity in the form of one DVI, one HDMI and three DisplayPort connections.

In terms of the performance, you can expect this card to hit somewhere in the region of 8,500 in 3DMark, which means it'll happily play *Fallout 4* or *Assassin's Creed: Syndicate* on high settings at 1920 x 1080 or slightly above.

Two More Budget Graphics Cards

Nvidia

If you need a graphics card for under £50, then the Gigabyte GT 730 2GB will fill most budget roles.

It's priced at around £46, which is cheap and cheerful, but you have to be aware that it has a lesser GF108 GPU, as opposed to the Asus GT 730 2GB and it only has DDR3 memory, a 700MHz GPU clock and 96 CUDA cores.

It's okay, and it'll play HD video and play older games fine, but don't expect too much from it.

AMD

The AMD equivalent for under £50 would be the Sapphire R5 230 2GB. Again this is DDR3 card, using a lesser Caicos GPU with a clock speed of 625MHz and 160 shaders. As before, it'll do the job, but don't push it too much.

AMD – Higher End

The MSI Radeon R9 380 Gaming 2G at £162 (goo.gl/KMpQUn) is the top of the mid-range scale for us and a very impressive graphics card.

The Antigua GPU has a base clock speed of 970MHz, moving up to 1000MHz in overclock mode, with a memory clock speed of 1425MHz.

It has 1,792 shader units and a huge TDP of 190W, with a pair of DVI ports, a single HDMI and a single DisplayPort for connectivity.

Although the clock speed is slightly slower than the GTX 960 above, the MSI Radeon R9 380 2G does a pretty good job when it comes to benchmarking. We've had a 3DMark score of 8,374 from this, along with an average fps of 39 in *The Witcher 3* with high settings at 1920 x 1080.

High-end Cards

If you plan to get the best possible gaming experience at much higher resolutions, well into the 4K region, then you're going to need to splash out for a high-end graphics card.

As you would expect, though, a high-end graphics card will cost anywhere from £160 to £270 and upwards. The top-of-the-range card at the moment is the Nvidia GTX Titan X, a monster



▲ GDDR5 memory is worth opting for when buying a new graphics card

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▲ The MSI R7 370 Gaming 2G

of a graphics card with 12GB of memory and a whopping 3,072 CUDA cores. In this case, the top-end price bracket starts at £1,050, but it's a phenomenal graphics card if you have the system capable of handling it and you have pockets deep enough to enjoy it without having to quit eating to pay for it.

Thankfully, there are alternatives in the high-end range that are a little more affordable.

Nvidia

The MSI GTX980 Gaming 4G with 4GB of GDDR5 memory at £399 (goo.gl/xpjj69) is an exceptionally impressive graphics card. The GM204 GPU has a base clock speed of 1127MHz and a boost clock of up to 1216MHz – more 8% faster than a stock GTX980. The memory clock speed is 1753MHz, and the card boasts 2,048 CUDA cores and a TDP of 165W.

Connectivity consists of a single DVI and HDMI port and three DisplayPorts on this dual-slot card.

As for the performance, we've seen this card hit a 3DMark score of 16,101, and as a result you can run the likes of *Fallout 4* with everything graphical setting maxed out at 2K resolutions with the frame-rate hitting between 55 and 60 constantly. And with *Star Wars: Battlefront* at 1920 x 1080 with everything set to ultra, it played beautifully and looked spectacular.

If you can afford £400 for a graphics card, then you'll be extremely happy with this.

AMD

The equivalent AMD graphics card would be the Gigabyte R9 Fury. Priced at around £440 (goo.gl/qC5pyV), this is as impressive a graphics card as the GTX980.

The Fiji GPU is clocked at 1010MHz, slightly faster than the stock R9 Fury, with a 1000MHz memory clock, 3,584 shader units and a TDP of an eye-watering 275W. And as with the GTX980, the connectivity consists of a single DVI, single HDMI and a trio of DisplayPorts.

As for benchmarking, we haven't managed to get our hands on one of these yet for testing, but we have heard that some users are boasting a 3DMark score of over 18,300. If that's the case, then you can expect the Gigabyte R9 Fury to run every game available at the highest possible resolutions your monitor can handle and with every graphical detail set to ultra.

What Do You Need?

The question of which one of these graphics you need is a difficult one to answer. After all, it depends on what you plan to do with your system. If you want a low-cost system that's capable of some lightweight gaming, mainly with older titles from a year or so ago, and you want to watch some decent HD films, then you can settle for a budget graphics card.

If you want to play games and enjoy a good level of graphical detail while still keeping the frame-rate high and you want to have a good media system as well, then one of the lower-end mid-range cards will suffice.

For something with a little more performance, the higher end of the mid-range will cater for the latest games at good graphical levels with high frame-rates. It will also future proof you in terms of VR for next year.

If, however, you want to knock the socks off everyone else and dominate the gaming scene, then you'll probably opt for one of the £400 graphics cards. Or if you happen to have a hefty income, then we'll probably expect you to go for the Titan X range of ultra-high-end cards.

“ There's a lot to get your head around when it comes to a graphics card ”

Those who simply want their computers to do day-to-day work, with maybe some video watching could get away with using the GPU that comes with a modern processor. In all honesty, while a dedicated graphics card will take some of the pressure off your system resources, if you're only ever going to watch YouTube videos and look at Facebook, you can do that without even the budget card fitted.

As we said, though, it depends on your situation and what you plan to use the computer for.

Terminology

We've purposely left the terminology of graphics cards till last, purely because it can be quite a lengthy and confusing subject,



▲ Moving into the lower end of the mid-range, the PNY GTX 750Ti is worth a look

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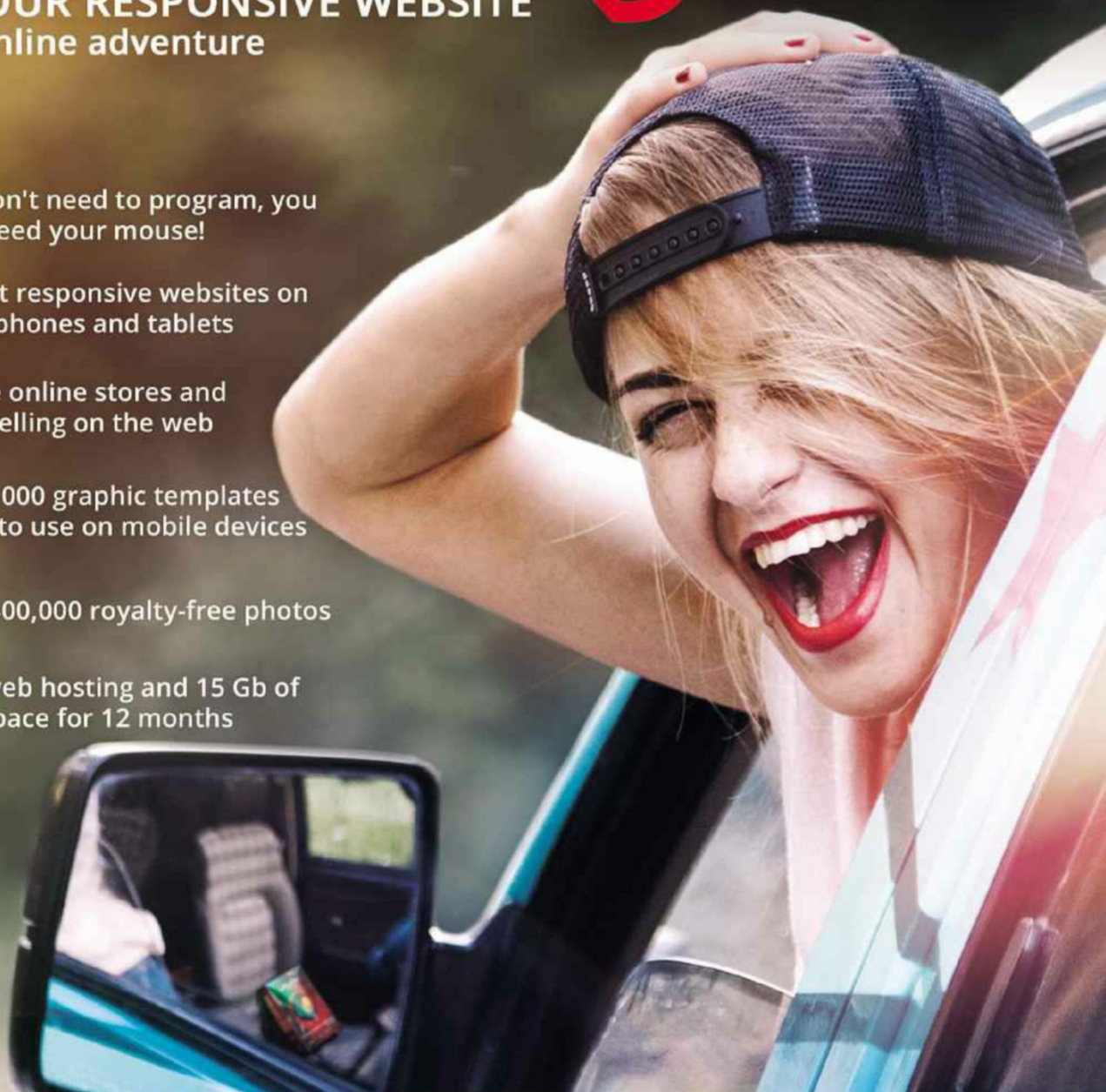
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▲ The higher mid-range cards present great performance for their cost

and it's the kind of thing that causes people to flick over the pages of a magazine without reading the content. We know – we do it ourselves sometimes.

The GPU

The GPU of a graphics card is its processor, in the same way that the Intel or AMD chip driving your computer is the processor. It might sound simplistic, but there's a lot of confusion when it comes naming components.

For example, a GTX 970 isn't a GPU; it's actually the make of graphics card. The GPU on a GTX 970 is called a GM204, and it's processed and made slightly differently to, say, the GPU on a GTX 960, which incidentally is called a GM206.

In these examples, a GM204 GPU has a process size of 28nm, 5,200 million transistors and a die size of 398mm². The GM206, meanwhile, has a process size of 28nm, 2,940 million transistors and a die size of 228mm². In terms of performance, the more transistors you can pack into that 28nm, the more powerful the GPU is likely to be.

However, other factors affect the performance, such as memory bandwidth and the speed and type of the memory, as well as the physical clock speed of the GPU – 1,050 on the GM204 versus 1,127 on the GM206.

You'll also notice that Nvidia has a model code, if you will, for its GPUs, such as GM204, whereas AMD likes to give its card GPUs names, such as Fiji or Caicos.

GDDR Memory

GDDR memory is basically the same memory as you'll find on your motherboard, but with different voltages and running at higher clock speeds.

The latest memory specification is GDDR5, which has a lower voltage and reduces the heat generated. Furthermore, GDDR5 allows for a better memory bandwidth, which will push the data through the GPU at a higher rate – in the simplest terms.

Basically, the more memory you have on your graphics card, the higher the resolutions you'll be able to hit and the more details you'll be able to push through at those resolutions.

Memory Clock Speed

GDDR5 memory runs from around 1000MHz up to 1500MHz; this is the actual speed of the video memory.

The memory can do four transfers of data every clock cycle, so often you'll see memory clock speeds rated at 4000MHz, which

Two More Mid-Range Graphics Cards

Nvidia

For £128, you could opt for the EVGA GTX 950 SuperClocked Gaming 2GB card. This is a decent GM206 GPU with a clock speed of 1152MHz (over 13% higher than stock speeds) and 2GB of GDDR5 memory, with 768 CUDA cores.

It's a little dated these days but is still good enough to run a lot of games with less graphical detail at 1080.

AMD

The XFX Radeon R9 380 Black Edition 2GB Double Dissipation model for around £149 is certainly a decent mid-range AMD card to try to get hold of.

It has an Antigua GPU clocked at 1030MHz (over 6% faster than stock speeds), 2GB of GDDR5 memory and 1792. It's certainly well worth checking out.

isn't the actual clock speed of the memory but rather the total data rate – at four times the real clock speed.

There are even times when you'll see a memory clock speed of 2000MHz. This is just nonsense, as it's only twice the clock rate and half the data rate.

Memory Bus

To make memory bus simple: there are several memory chips mounted on a graphics card, and a GPU can read 64 bits of memory at a time from a single memory chip.

To speed up the memory bandwidth, though, some GPUs can read from two memory chips at the same time, so that's two times 64-bit, which equals 128-bit. That's the memory bus.

The memory bus increases all the way up to 4,096-bit in the case of a R9 Fury X, where it has eight lots of 512-bit memory controllers. Which is quite a lot.

CUDA Cores And Shaders

Stream processors, shaders/shader units and CUDA cores are all, essentially, one and the same thing.

The terms all refer to the cores within a modern GPU, which go to processing all that graphical and mathematical data in the form of shading pixels according to how light hits them in a 3D environment. These cores, though, perform differently depending on the manufacturer of the GPU.



▲ The Nvidia GM206 GPU: the heart of a graphics card

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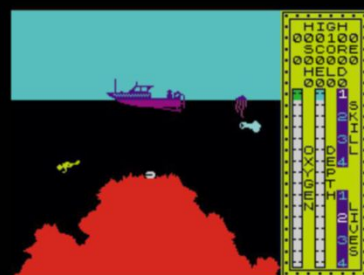
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▲ The MSI GTX980 will knock the socks off any game you own

In the case of AMD GPUs, the stream processors or cores are called shaders or shading units. So the MSI Radeon R9 380 Gaming 2G has 1,792 shader units or 1,792 cores to help form the pixel shading routines.

Nvidia, on the other hand, has developed a more complex method of shading with its CUDA (Compute Unified Device Architecture) cores, which improve the overall processing power of the GPU. In the case of the MSI GTX980 Gaming 4G, with its 2,048 CUDA cores, there are 2,048 advanced shader cores.

As to which version of stream processors is better, at the moment we're tempted to say Nvidia's CUDA cores have the edge over AMD's shader units, purely because the CUDA core is a little more advanced and can often be found helping boost the parallel processing power of supercomputers.

TDP

Thermal design power (TDP) or, as it's sometimes called, the thermal design point. Basically it means the maximum amount of power/energy a processor – GPU in this case – needs to dissipate the heat generated to keep the component below its maximum temperature range.

So in the case of the MSI GTX980 Gaming 4G, it needs 165 watts of cooling power to keep the heat down. It doesn't necessarily mean that the component will be consuming that amount of power all the time, but it means that the amount will possibly draw that much energy over a sustained period of time.

You can, however, draw some conclusions based on a GPU's TDP, in that the higher the TDP, the more heat needs to be siphoned off by the cooling solution. That usually means the more heat, the more work the GPU and other components are doing, so effectively the card may well be performing better than an equivalent model with a lower TDP.

3DMark

3DMark is the benchmarking tool created by Futuremark to test the performance of a graphics card's 3D rendering and GPU workload.

The better the number, the better and more detailed graphics can be had from the card. The example of the MSI GTX980 Gaming 4G with a 3DMark score of 16,101 is really quite high and means it'll easily be able to handle the intense 3D work needed to play the latest games at high resolutions and with the highest graphical setting.

Two More High-End Graphics Cards

Nvidia

The £303 EVGA GTX 970 FTW+ Gaming ACX2.0+ 4GB card is a splendid GM204-based card clocked at 1216MHz (16% faster than stock speeds), with 4GB of GDDR5 memory and 1,664 CUDA cores to its name.

It's a great graphics card and will play anything you can throw at it with high detail levels at 1080.

AMD

If the previous high-end suggestion of the R9 Fury didn't float your boat, then perhaps the £355 XFX R9 390X Black Edition Double Dissipation 8GB card will.

It has a Grenada GPU clocked at 1090MHz (4% faster than stock speeds) and an impressive 8GB of GDDR5 memory with a 512-bit memory bus, as well as 2,816 shaders.

This is a pretty amazing card if you're a fan of the AMD camp.

It's not always the best real-world benchmark, though. You're always better trying to find a system that's similar to your own in terms of processor, memory, hard drive and even Windows version, to compare a graphics card with. If a similar system can play *Fallout 4* at 60fps at 1920 x 1080 resolutions with one card, but only 30fps with another, then you can happily say that the 60fps card is going to be better.

Conclusion

There's a lot to get your head around when it comes to graphics cards, which is why we often crave the old days of simply buying 4MB graphics cards and being able to play *Doom* on our DX2-66.

However, if you take the time to look into the GPU the memory, its bandwidth, the number of cores or shaders and what the TDP is, then you'll be able to judge which is the right card for you and the best value for money and performance. [mm](#)



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The 20 Pieces Of Equipment That Every IT Professional Should Own

Mark Pickavance reveals
the gadgets and gizmos that
help anyone who works in IT
to perform at their best



If you work in IT or just take your computing seriously, then having the right tools for the job is rather critical. Trying to bodge something or just running into a brick wall can make a small job take much longer than it should, and in a business context, time usually equates to money. However, a few mostly inexpensive items can provide you with the key accessories to help you fix problems and do so efficiently.

Here are some of the items that IT people should own or have access to in the modern computing environment.

1. Magnetic Screwdriver

Probably the best £1 you'll spend if, like me, you end up taking apart and rebuilding lots of computers. The specific ones I'm talking about are those that have a magnetic element under the interchangeable head that can be extended telescopically. It's perfect for hunting screws that fall down under desks or underneath the motherboard inside a PC. Unless you like crawling around on the floor or holding desktop computers above your head and shaking them, like you're the Incredible Hulk, then buy one.

“ If you've ever tried to fix your phone, you'll soon realise that these things weren't made to be disassembled easily ”

2. USB LAN Adapter

I only got one of these a couple of years ago, and I now regret that I didn't get one much sooner.

USB 3.0 has enough bandwidth to allow you to connect a gigabit LAN cable through it and provide that sort of network performance even if the machine doesn't have an alternative Ethernet port.

I'm sure some of you are wondering what's wrong with wi-fi? Well, wi-fi doesn't always work, isn't remotely as quick as the promotional info, and is rapidly degraded by other high-demand users around you.

If you have lots of updates to do on a PC, like when you've just installed a fresh version of Windows, then a wired Ethernet connect is the way to go, trust me.

The bonus feature is that it's possible that you end up with a driver upgrade for the wi-fi in a laptop that doesn't work, and suddenly you have a driver fix you need to do that requires networking when you've banjaxed that feature.

The StarTech USB 3.0 gigabit adapter costs £20 and can save you tons of time with machines that don't have a working LAN socket.

3. USB SATA Adapter

Let's imagine a scenario where you've brought a laptop that's had a unfortunate accident, yet what's on the hard drive needs recovering. Opening up a desktop PC is a pain to mount a drive on a temporary basis, so what you want to do is something less invasive. There are two approaches to this: either a mounted removable drive tray or a USB SATA adapter. The tray is likely to be a more expensive option, and it assumes a desktop PC, where many IT people these days have a laptop.

The alternative is a simple USB device that allows you to plug any drive into the system to secure the contents or scan for damage. These are very easy to find, can cost less than a tenner and make extracting the contents of old drives much easier.

If you often have to do drive transfers, I'd recommend you either get either a USB 3.0 variant or a SATA swappable tray,





because USB 2.0 isn't quick enough to move 500GB of system in any reasonable time frame.

4. Bootable USB Or CD-based OS

I'll talk about the more general uses of USB keys later, but what I'm referring to here is a USB key that you've made bootable with a working OS on it.

Notice that I didn't say what OS you should use, because that's a personal choice, and there are many to choose from. Lots of IT people like Linux, and most distros come in a USB bootable form that you can fire up on any system that will boot from USB.

But why would this be a useful thing to do? Whenever you have a problem with a PC, one of the most useful things to know is if the situation is one where the OS has failed, the hardware or even both.

“ If your IT location has monitors that can only accept VGA inputs, you should be encouraging their retirement ASAP ”

What a bootable OS can offer you is a simple means to discount the hardware from the equation, because if it works from the USB key, then it's almost certainly damage or corruption of the installed OS.

They can also be useful to pull the personal files off a system before you blitz a new version of Windows on there, should it stop working.

A quick search around the internet can also find you some very useful boot images, like Hiren's Boot CD and FalconFour's Ultimate Boot CD. Having one of these pre-installed on both CD and a USB in your bag can help you quickly move to the remedy stage of any assessment, rather than guessing at what the problem might be.

5. USB And PS/2 Capable Keyboard

This might seem rather obvious to some, but for numerous reasons, some systems don't work well with USB keyboards when you want to access the BIOS. It might be that at the point they initialise the USB subsystem, things progress so rapidly into booting the OS that you don't get an opportunity to catch the key presses.

Whatever the logic is, having a PS/2 keyboard, if the PC can use one, can get you into the BIOS whereas a USB-only design would be much more hit and miss. Ideally, you want one that is both, and some of those adapters that convert from one to the other are also rather handy.

It's also worth noting that on early USB 3.0 implementations, this function is provided by a third-party chip that often only becomes active once the OS has booted and its drivers are installed. Therefore, putting a keyboard into one of these blue ports won't help or can even make the system hang on boot.

6. Spudger

'A what?' you might ask in reaction to the word 'spudger', but it's a real thing and not something I made up. In simpler terms, a spudger is a narrow-edged device that's often made of plastic (although it can be metal), used to pry tight-fitting components apart. Anyone who works with laptops, phone or tablets will need one, because they're vital for getting inside should anything go wrong with them.

If you've ever tried to fix your phone, you'll soon realise that these things weren't made to be disassembled easily, and often a little force is required. What you don't want to do is destroy the thing that you're trying to fix when getting inside, so you need to use something that will be kind to the phone and yet apply enough leverage for success.

Those that do this sort of job often usually have a selection of spudgers, supplemented with other thin plastic items like old credit cards and guitar picks.

If you intend to get inside Apple devices, you might need some specially shaped ones, because it really doesn't want anyone fixing its expensive hardware when buying a new item is so much more profitable.

For general computing use a plastic spudger is also a useful item for separating cable connectors on a motherboard where using something that conducts electricity would be a bad plan.

Unless you need the professional versions, a nice spudger costs pennies, and unless you sacrifice it on a difficult fix, it can last a long time.



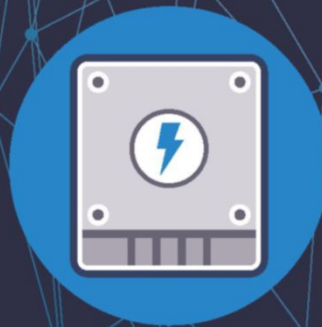


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7. Unused USB Keys

USB keys were once so special, but these days they practically fall out of breakfast cereal packets. But for anyone who works with computers on a regular basis they're also remarkably useful, and you don't need to buy especially big ones either. For general use, 8GB ones are fine, and even smaller ones have their purposes, if you can find them.

Anyone with a computer should have at least one with their recovery on it, as you were encouraged to make when you first ran it. If you don't have this, go do it now, because at some point you'll invariably need it, and when you do, it'll too late to make one.

It's also a good policy, while the system hasn't ballooned to a silly size, to use another to make a system image of the installation. With these two drives you should be able to put Windows back on a PC if the drive dies or the OS gets irreparably damaged.

If you want to, you can also get an .iso of the OS and make that a bootable USB key using software tools it's easy to find on the internet. Microsoft even provides one these days.

Thankfully, some flash drive makers, like Lexar, have realised that IT people use them by the handful, and actually make packs with multiple drives of different colours. A four-pack of Lexar 8GB V20 Jumpdrives can be found for less than a tenner and can make system recovery much less stressful.

8. Video Cable Converters

There isn't an IT job more annoying than one where you suspect that there's a problem but you don't have the right equipment

to prove that conclusively. One that I've run into numerous times is when a laptop appears to be working but there's no display.

There are at least three common possibilities: the display is broken, the display driver is disabled in the OS or the user has inadvertently switched to external display mode. What you need to do is attach the computer to an external display so you can see what, if any, messages the machine is showing.

These days that is complicated by the slimmer case designs that have encouraged laptop makers to use mini-DisplayPort instead of HDMI, VGA or DVI.

Statistically, DisplayPort screens aren't that common, and there's a good chance that nobody had a mini-DP-to-full-size-DP cable to connect it anyway.

What's really useful at this point is a collection of video cable converters that get you from mini-DP to HDMI, DVI or big DP. They cost very little from eBay, though they can be expensive if you are crazy enough to shop at certain well-known retail outlets.

You can also get some multi-port converters that do a range of exchanges all in one device. The conversion you should be very wary about is VGA, because that's an analogue signal that won't easily be converted to a digital format. A cable can't do that, so it will require some sophisticated electronics that probably aren't worth the expense.

The moral of this tale is that if your IT location has monitors that can only accept VGA inputs, you should be encouraging their retirement ASAP.

9. Voltage/Amperes Metre

There are generally two types of IT people: those who just accept something is broken and those who'd actually like to know what's wrong and if it's potentially fixable. For the latter, a voltage tester is a critical tool, because it allows you to probe inside the power distribution of the PC for potential faults or dodgy connectors.



What I need to stress, though, is that if you have no idea about electronics, then you shouldn't be going anywhere near a live computer with any probe, because touching the wrong part could kill both the PC and you.

These devices come in two basic types, one of which is really meant for testing mains amperes and wiring and another that is designed to give you the values of current and voltage running in solid-state electronics.

Depending on how sophisticated they are, some can also test resistance and even check if individual components are working. Having one of each can be useful, and you can buy them

“ Some of the screws that are used in systems these days are incredibly small ”

relatively inexpensively from a wide range of outlets. Just don't be tempted to get one if you have no idea what you are doing with it, because that can end very badly.

10. Network Cable Tester

I bought one of these about ten years ago, when I was cabling my own home for Ethernet, and they're very useful indeed. Costing less than £10, they use a small battery to send voltage over a CAT5e or CAT6 cable, providing LED feedback about which line is being tested.

If the cable is good, then the LEDs on both parts should run in parallel, unless there's a crossed cable or a line break.

Because the left and right parts can be pulled apart, you can use it to test sockets at the end of a very big cable run by using previously tested patch cables.

Anyone who's doing networking should have one of these, because they can save you many hours of problem hunting.

11. Thermal Compound

I've seen people take the heat sink off a CPU and then just plonk it back on when they're done, and that's a very poor plan at best.

When thermal compound is applied, it usually has the consistency of butter or cream cheese, so that when pressure is applied to the cooler, it spreads out to the ideal thickness. That's because the purpose of the compound is to eliminate potential air gaps between the CPU and the cooler, providing a thermal bridge for heat to flow. However, once it's been in the system for a few days, it will solidify as it's dried by repeated heating.

Therefore, when you remove a cooler from any chip, you should clean it off and then reapply the thermal compound for proper efficiency. Failure to do this can easily lead to overheating, reducing the lifespan of components.

Unless you use it by the gallon, thermal compound (or grease as it's sometimes referred to) doesn't cost much, so you should always have some handy.

12. Watchmaker's Screwdriver Set

If you haven't noticed, some of the screws that are used in systems these days are incredibly small – too tiny to be easily removed with a conventionally sized screwdriver. What you need is a set of screwdrivers that are made for watchmakers or jewellers, because these are perfect for removing tiny screws without damaging them.

For the dismantling expert, you should also consider getting a set of Hex keys and ones for removing Torx/TRX/Star security screws also.

The use of those last designs, and some specialist designs that Apple and others have use, can make fixing some equipment close to impossible without the right tools.

Where a watchmaker set and a Torx collection can easily costs you less than £20 combined, some of the very specialist head removal tools can be expensive. Because of this, it's worth doing some research before you start taking things apart, so you don't get stuck at any point during the procedure.





Every IT person should own a decent set of screwdrivers, if only for fixing their own home equipment.

13. Tripod Torch

I'm not sure why, but many times an IT person will find themselves in poor lighting conditions, trying to find something implausibly small. For those jobs, I generally carry a small hand torch, but there are times when you find what you're looking for, and then you need illumination and simultaneously your hands free to work.

The best gizmo for this job is a torch that either has its own adjustable tripod or flexible 'fingers' that allow it to throw the light in a specific direction while you carry out the fix.

I've been through a few of these, because some aren't well made or especially reliable. They're also completely useless if you've forgotten to put charged batteries in them since you used it previously.

How much you spend on one of these is up to you; some can be quite expensive, but in a tight space with little natural light, they can be a godsend.

14. Dual-band Wi-fi Adapter

This is a bit of an odd one, because it addresses a problem I ran into only recently. Since Microsoft made Windows 10 much more aggressive at installing updates, and the users have less control over them, I've seen a number of situations where internal wi-fi drivers get updated on a portable machine and then don't work, as I mentioned earlier with the USB LAN adapter.

Having an alternative wi-fi adapter handy is another way to solve this problem, but it also has some other bonus advantages. Many NAS boxes now support wi-fi dongles, and it's one way to connect to them in the event of a wired LAN failure, and the same is true of servers.

It's also useful if a machine with an existing wi-fi adapter doesn't function and you want to work out if the problem is hardware or software based.

Even the 'ac' class ones these days don't cost much, and they give you an alternative network connection for any machine with a USB port. Just remember to put the drivers on a USB flash drive in case you need them.

15. Labelling Machine

Labels are very helpful, because although you know what you did, there's no guarantee that anyone else will understand if you're unavailable.

Depending how seriously you take labels, you can choose from a range of handheld devices to ones that are meant to be operated from a computer. What's great about these things is they make ad hoc clear and adhesive strips that you can apply quickly to most items with a flat clean surface.

If you have cable labelling problems, then you can buy special lockable tags for those, and they cost only pennies for bags of 50 or 100. The one I use is a LetraTag, and it comes with a number of paper types designed for specific jobs. The manufacturer also makes a range of colours, if you also like colour coding stuff.

Starting at about £20, these gadgets are ideal for adding clarity to any network room and also for providing identification codes to computers.

For those who really like these sorts of things, some of the larger format PC printers can be used to print QR codes that can contain lots of information when accessed with a phone.

16. NFC Stickers

The trouble with labels I previously covered is that they can get easily removed, damaged or intentionally swapped by people up to mischief.



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A potentially better idea is NFC stickers that you can buy for less than 50p each, which can be accessed by any phone or tablet with a NFC capability.

These can be programmed with information by a phone or an NFC programming tool and then stuck in a location that isn't visible on the outside of the machine. For a laptop, this could be under the keyboard or under the service hatch. In both locations, you should still be able to read the data using a smartphone.

Precisely how much data you can include is dependent on the chip used in the sticker, but even a small amount can point to a database where much more is associated.

“Dust is your greatest foe, as this insidious stuff sticks to computers through the infinite powers of static electricity”

19. Small Vacuum

Dust is your greatest foe, as this insidious stuff sticks to computers through the infinite powers of static electricity. As a result, whenever you open up a computer, desktop or laptop, you're inevitably confronted with it.

In reality, any vacuum will do, and even a compressed air canister at a pinch, but dust needs removing, and some control over the process is helpful.

I use an old Dyson DC16, but you could use any 'dust buster' design that can deliver pinpoint suction inside the computer.

Whatever it costs, I can assure you that it will be less than the expense of letting the dust collect to the point that it fries something.

20. Google Chromecast

Most people think the Chromecast is just about a neat way to put streaming TV services on your screen, but it has wider applications for the technically minded. The obvious one is to cast presentations quickly and efficiently from a laptop, phone or tablet without any messing around with cables.

So while that annoying person from human resources is still looking for the output redirection on their laptop, you've thrown your PowerPoint presentation up on the boardroom TV in a blink.

At just £30, the Chromecast is something every IT person should have, if only for their own use. [mm](#)

17. RJ45 Crimp

Network cables going wrong isn't unusual, and I've thrown away plenty. But what do you do if the cable that has a problem is a very long one that snakes through a building? The answer is you need to reterminate it, and see if it's just the RJ45 receptacle where the problem lies.

To do this you'll need a crimp and a fresh connector, neither of which costs much to buy. A decent crimp can be had for less than £10, and a bag of 100 less than a fiver.

Being able to replace a damaged cable end is a skill all IT people should have, though you'll need a crimp to achieve it.

18. Krone Tool

I first got one of these to do some telephone wiring, but they're also very useful for anyone who needs to wire (or rewire) a network socket. What this does is help you insert wires into the blocks you find either in patch panels or network sockets. When you press down, a blade forces the wire down into the block and at the same time a scissor action cuts off the excess wire. It can only go wrong if you have it the wrong way around, and it cuts the cable off on the run side.

These cost very little, and depending on how much you're likely to use it, you might want to consider buying a higher-quality version.





How 3D-printed rats could offer schools a vegetarian dissection

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A fresh take on technology

Where Are We Heading?

Mark Oakley looks at driverless cars and wonders whether the future really is autonomous

The idea of the self-driving car has been around for decades. Any self-respecting sci-fi fan would have seen countless on-screen examples of cars that drive themselves. *Minority Report*, *I Robot*, *Total Recall*: just three examples of how sci-fi writers have viewed the future, a world in which even the laziest of people can get that little bit lazier.

Technology is often criticised for bringing out the very worst in us, and certainly the notion of not having to lift a finger to get to work or go to the shops is mightily appealing to many people. Until relatively recently, this was merely the stuff of science fiction, but the last few years has seen car manufacturers such as Nissan, Tesla and Volvo working on their own interpretations of autonomous vehicles.

Here's where some of the key players are at right now.

On The Road In A Year?

Nissan recently made the rather bold claim that it will have its self-driving Leaf model in roadworthy form by the end of 2016, which may seem like the stuff of fantasy, but it's worth noting that Nissan has been among those at the driving seat of the autonomous car movement, having been the recipient of Japan's first licence for autonomous driving in 2013.

Back then, Nissan's aim was to get self-driving cars on the roads by 2020, but things have obviously gone rather better than expected, because Nissan is now claiming to have actual, partially autonomous cars to sell to the public by the end of next year. This is significant, as it marks a step up from merely testing autonomous vehicles, which has been the case up until now. Nissan's plans will be three-tiered, starting with availability of autonomous cars for single-lane highway driving. By 2018, Nissan is planning on cars that will enable lane-changing on major highways, and by 2020, it's going to add navigation around urban roads and intersections, essentially meaning full automation. That last one is really the end point of all of this, and it's where the manufacturers are placing their finances. If cars can't get to that point, to be fully automotive around every type of road, then this concept is never going to be fully realised, at least in any commercial sense.

Nissan has also been looking further to the future with its showcasing of another vehicle at this year's Tokyo Motor Show. The IDS Concept is an all-electric, AI-equipped car that adopts advanced vehicle control features. It's just a concept car at this stage, but this is quite likely to help bring the manufacturer's vision of a fully automated

vehicle closer to reality. IDS uses what Nissan calls Nissan Intelligent Driving and advanced AI to learn driving styles and adapt to different road conditions. Place the car into Piloted Drive mode, and the steering wheel retracts while the seats move inwards, so passengers can chat more freely. As for the driving, the on-board software imitates the driver's style using information on road conditions, which are relayed to the car via a whole host of sensors and cameras. You can switch on manual mode on the car, but there will be the comfort net that the sensors and cameras are always on to intervene in the event of any potentially dangerous situation.

Nissan is pushing the safety aspect of autonomous driving, with statistics suggesting that 90% of accidents and crashes are caused by human error. This may be true, but unless everyone drives autonomously, then this is hardly going to stop those crashes from happening on the roads.

There are others standing alongside Nissan in the race for autonomous dominance. Step forward Mr Musk.

Tesla Takes Its Chance

Elon Musk is an entrepreneur and inventor with a net worth of an estimated \$12bn or so. He has invested in his own SpaceX private spacecraft company, he has ranked among Forbes' most powerful people on the planet, and now he wants to revolutionise your driving experience.

Tesla Motors, Musk's electric car company that has been doing decent business over the past few years since its inception in 2003, has taken the natural step for a company run by someone who clearly has an eye on the future. The company's first foray into autonomous driving came not with a car but with a software update. The firm's Autopilot software was delivered to owners of its Model S electric car, allowing drivers to test it out while it's still in beta.





This was a somewhat brave move and one that saw tens of thousands of cars made semi-autonomous overnight, all thanks to an over-the-air update matched with the requisite hardware that was already equipped to the Model S vehicle: forward radar, forward-looking camera, over ten long-range ultrasonic sensors that sense 16 feet around the car in all directions, and a digitally controlled, electric assisted braking system.

I wrote semi-autonomous, and that's quite important. The Autopilot software can be enabled via the Status bar on the driver console and, according to Tesla Motors' own blog post, it "allows Model S to steer within a lane, change lanes with the simple tap of a turn signal, and manage speed by using active, traffic-aware cruise control. Digital control of motors, brakes, and steering helps avoid collisions from the front and sides, as well as preventing the car from wandering off the road. Your car can also scan for a parking space, alert you when one is available, and parallel park on command."

The key here is that the driver has to have their hands on the wheel at all times – this is software that's in beta, after all. Tesla Motors wants its drivers to remain safe at all times, and as they're ultimately acting as the real-world testers for this software, part of that process might involve the odd hiccup now and then – hence the need to keep hands on the wheel.

As for hiccups, they have come. You'll have no doubt seen or heard about some of the video clips that went online of Model S drivers swerving into oncoming traffic. One video even showed a chap reading a newspaper while leaving the car to do its thing. Elon Musk was quick to respond, stating that these drivers weren't adhering to the company's advice and were clearly not leaving themselves in control of the vehicle at all times. Also, many of the clips were of drivers taking to minor roads, rather than sticking to the major highways that the software has thus far been built to sense its way around. In doing so, the clips effectively gave Tesla one mighty get-out over what might have been bad publicity, and Elon Musk himself has since said during a quarterly financial call that it might limit its activation among consumers in order to limit "the possibility of people

doing crazy things". He was also clear on the software being in beta and that it would naturally improve over time.

He's confident of the self-driven future too, stating that he thought it would be "quite unusual" to see cars without full autonomy in 15 to 20 years. For Tesla, the timeframe is going to be much sooner than that.

“ One video even showed a chap reading a newspaper while leaving the car to do its thing ”

Google Gets Behind The Wheel

Google's own foray into the world of autonomous driving began in 2009, although the key date is arguably 2012 following the passing of laws in Nevada state allowing for the testing of driverless vehicles. In May of that year, Google took advantage of the law by equipping a Toyota Prius with its own trial technology.

Run by Google's Project X team, Google's own technology has had to use various car manufacturers as partners. Over the past few years, Toyota, Lexus and Audi have all trialled Google's technology in specially modified cars, with reports of hundreds of thousands of dollars spent on putting these vehicles together. More recently, Google has developed its own prototype vehicles, without any steering wheel or pedals, allowing it to fully test the capabilities of what its cars (nearly 50 of them) can do.

Google's self-driving history hasn't been free from incident. Using the streets of Nevada, California and Texas as its testing grounds,



Mountain View, San Francisco has become a particular testing ground and, according to Google, over a million miles have been self driven to date. Indeed, according to its latest monthly report (these are freely available to read on at Google's genuinely interesting self-driving car project blog), around 10,000 to 15,000 autonomous miles per week are being covered on average on public roads.

And this is the important thing, here. Google is testing its technology on public streets, which is important if this technology is ever really going to get off the ground. Google itself acknowledges some of the issues surrounding autonomous driving. In its October Monthly Report, it wrote of some "worrying things" it noticed in the early weeks of the project's inception. Tales of "silly behaviour" including someone who turned around to the backseat to charge his phone, while travelling down the freeway at 65mph. People generally were paying less attention to the driving experience, and that led to them relaxing too much. This "handoff problem" of drivers being able to be engaged enough to take control when necessary is at the heart of the debate surrounding autonomous driving. How can it be proven to be truly safe if drivers are just switching off their brains?

According to a study, cited by Google, from America's National Highway Traffic Safety Administration, participants took up to 17 seconds to respond to alerts and take control of the vehicle again. That's the equivalent of covering over a quarter of a mile on the highway. That's also clearly potentially fatally dangerous.

But Google is sticking to its plan. It's isn't interested in semi-autonomous vehicles; this isn't where the technological interest lies for Google's engineers. Google's goal is "to transform mobility by making it easier, safer and more enjoyable to get around."

The project team has stated, "We believe that the full potential of self-driving technology will only be delivered when a vehicle can drive itself from place to place at the push of a button, without any human intervention."

It's working towards a 2020 date for cars, and some would suggest that this needs a reality check, that to have a vehicle that can drive itself and that can react and predict any driving situation on any road is a pipe dream. It's certainly a dream that others are prepared to buy into. Apple is reportedly working on its own self-

Self-Driving And UK Law

Earlier this year, the UK government not only greenlit a bunch of driverless-car trials around the UK, it also actively encouraged autonomous vehicle production by stating a desire, according to transport minister Claire Perry, to make Britain "the centre of autonomous vehicle manufacture."

Interestingly, there are no specific legal restrictions on testing self-driving vehicles in the UK, although there is a Code of Practice surrounding the testing process. Provided the vehicle in question complies with UK traffic law and that those providing the testing experience ultimately take responsibility for the safety of all involved, then testing can take place. Beyond that Code of Practice, it's actually a relatively regulatory-free space, however, which isn't all that surprising given that this is a fairly new area of technology.

The government has distinguished between semi-autonomous cars and fully autonomous ones, the point being that semi-autonomous cars still fall under current driving laws, as they require human input and control at all times. For fully autonomous ones, that will require a rethink as and when they appear, because they could conceivably transport non-drivers with no knowledge of roads. Perhaps one of the biggest decisions will be who takes responsibility for an accident, with Volvo recently stating that it will take full responsibility should one of its autonomous cars crash, although it's one of the first manufacturers to be so open about this potentially problematic scenario.

driving electric vehicle, and manufacturers as revered as BMW are openly working on their own technologies.

Google's project is chiefly based on the philosophy that a computer can drive better and, most importantly, more safely than humans. For Google, it's all or nothing. Semi-autonomous driving still involves human error, still takes time for humans to adjust. With a computer, there are no errors. It's the perfect system – until you get a system failure. [mm](#)

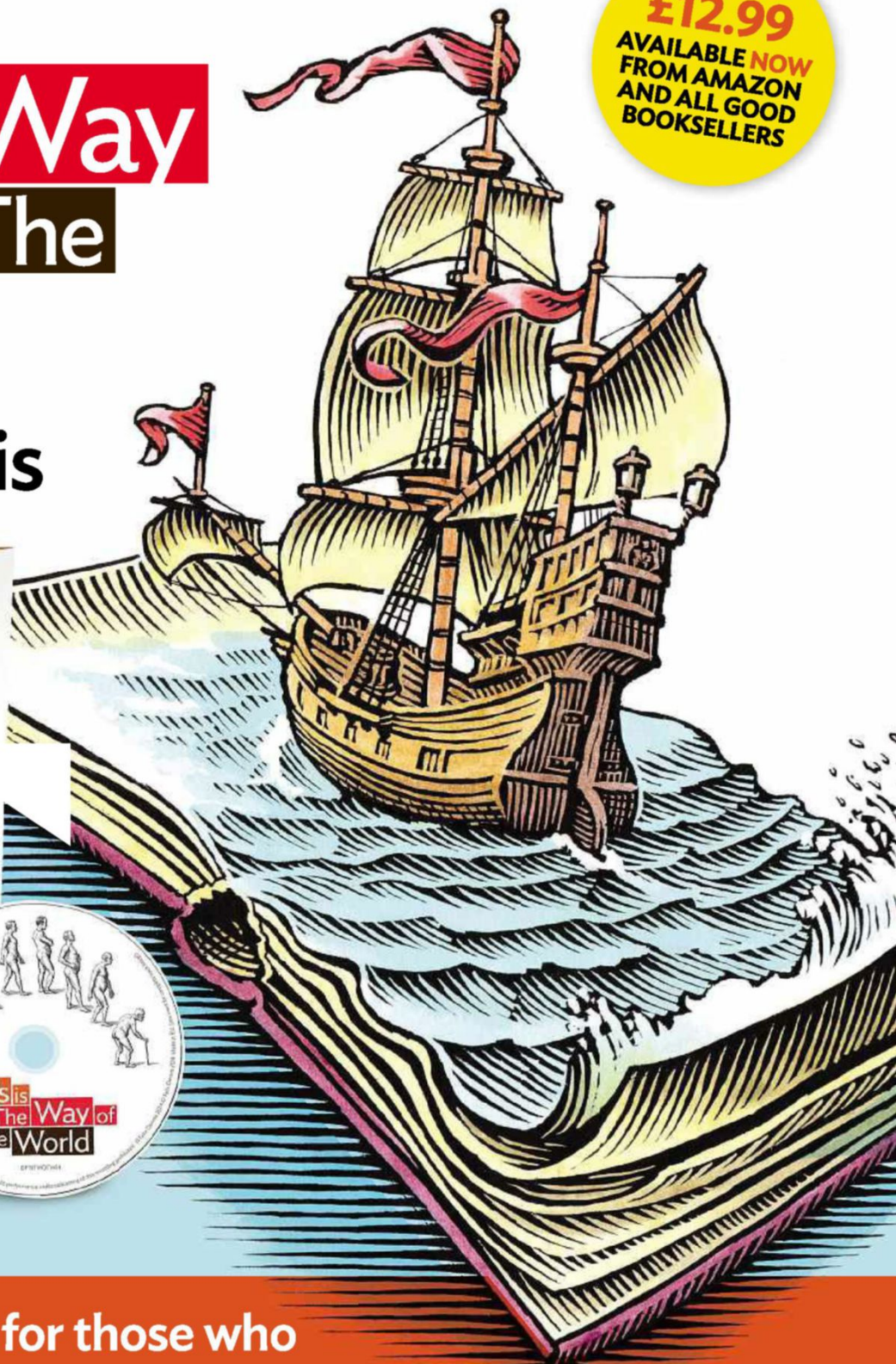
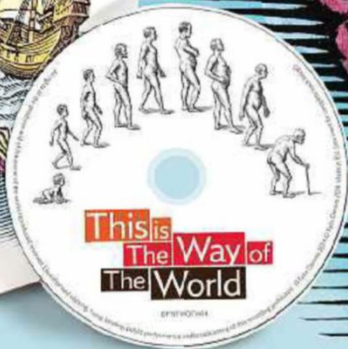
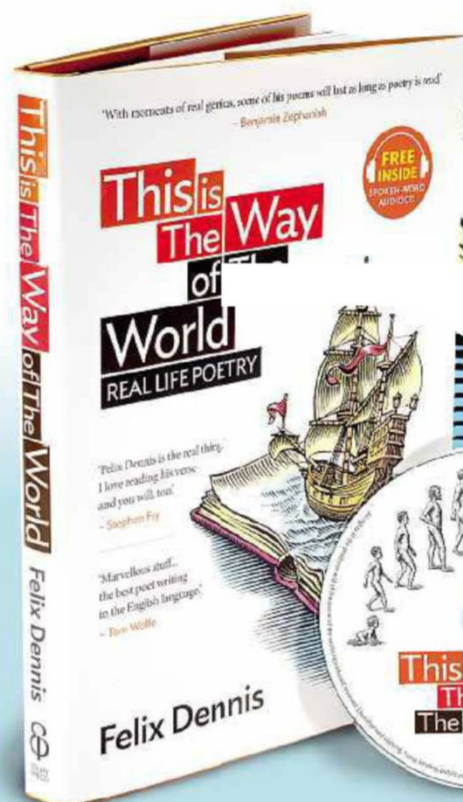
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Your Letters

The Case Continues!

Readers may recall (from Issue 1389) that I ordered a new case to replace my 'battleship' legacy unit. Recently bereaved, I had foolishly tried to put 'new wine into old wineskins' so to speak. Feeling more confident, I welcomed the arrival from www.cclonline.com of a neat Micro-ATX, XIGMATEX black case, standoffs, screws, and wait for it, a shiny new Kingston 120GB SSD. How brave!

Unpacking the case, it rattled and a metallic clunk resounded. Maybe just the cables? Removing the very tight fitting sides (First tip; use a flat-blade screwdriver on the rear fold-over to avoid damaged fingers!) revealed the problems; four loose feet, an unidentified spare bit of 15 x 4 cm metal, plus a surplus odd object. Not a good start. Having removed all the gear from the legacy case, I proceeded with caution. Second tip; make a paper template of your new motherboard's mounting holes.

My Gigabyte GA-78LMT-USB3 m/b is Micro-ATX, and the case description is Micro-ATX. No problem then? Well, using the template, I screwed in seven stand-offs, but where was the eighth vital tapped hole? Inaccessible underneath the HDD mountings! It took almost an hour to screw in the final stand-off, and fit the m/b with backplane. That final stand-off supports the m/b nearest to the 24-pin power socket. Third tip; don't leave out a stand-off unless you want to crack your m/b. Next problem. My m/b, 244 x 244mm, protruded about

30mm under the HDD mountings, leaving just enough room to plug in the 24-pin power cable. The sys-fan (only one) socket was obscured but useable. If the manufacturer had only machined large clearance holes above said stand-off, no problem.

Powering up the m/b satisfactorily (forth tip) before testing 2x HDDs and 1x SSD, I proceeded to install Ubuntu 14.04 LTS on the SSD. I forgot to set the BIOS to AHCI (Advanced Host Controller Interface), but the install went perfectly, including wi-fi, and the SSD was great. Setting the BIOS later to AHCI produced lightning speed. Very impressive. So, my 'widower' brain cells were still functioning; that was until I couldn't find the specified SSD mounting. There was none. CCL specifications were 2x 5.25", 3x 3.5" and 1x 2.5" but in fact only, 2x 5.25", 2x 3.5" and no 2.5". CCL let me keep the case because of my hassles and refunded me £20. Great company, CCL!

My local friendly PC repairer told me, "you don't need an SSD mounting. Screw it wherever you like," he said. Yes, SSDs are more tolerant than HDDs, but I like things tidy, so I made a bracket.

Now if only I could get my head around UEFI versus BIOS! Also, when/if Windows 10 SP1 comes out, how to do a clean Windows 10 install to reformat an existing Ubuntu 14.04 SSD? Help! I must get back into my novel writing. My 'cases' always get solved.

Robert Rycroft

Windows Slow Boot

This observation may help others.

I have an Asus N56V laptop (i7 processor, 8GB memory and Nvidia GeForce GT 635M Graphics). It came with Windows 8. Days after I bought it I tried various replacement Start Menu programs and settled on Start Menu Reviver. This has been in place though all Windows updates from 8.1 to the very latest Windows 10 (Threshold 2) and the latest GeForce card driver updates. My laptop has always taken over 5 minutes to boot so I have been using Hibernate and Sleep a lot instead of a total shut down.

Recently, I decided to investigate why my boot times were so poor and after following various online and magazine suggestions I got the boot time down to 3 minutes, still not very good. As I now had the latest Windows 10, I decided to look again at it's Start Menu so I disabled Start Menu Reviver and

rebooted. Boot time 1 minute 30 seconds! Shutting down and rebooting again and it booted in 70 seconds – and these times are repeatable.

When I re-enable Start Menu Reviver I am back to slow boot times. I am using a program called BootRacer to measure the boot time and it shows little difference in the time Windows takes to arrive at the Desktop. The savings are during the Asus Splash Screen. This stays on for a couple of minutes with Start Menu Reviver enabled but for only a few seconds with it disabled.

I have informed the software company, but to date have had no reply.

Start10 and Classic Shell Start menus do not have any impact on the boot times, but even the latest Start Menu Reviver (3) seems to cause slow boot times.

Grahame Sanders

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Remembering... Netscape

This week, we salute the king of browsers

Back when the internet was still a little new and didn't have the polished gleam of HTML5 and other sorts of impressive modern content, we lightly moved from one home grown web page to the next using Netscape. Well, most of us did, anyway.

Netscape was lightweight, and it didn't rely on the constant drip-fed advertising that Internet Explorer was pushing on early users of the web. It was a simple browser for a simple internet, and it evolved into something more complex as the online world grew around it.

Netscape Mail soon came along, followed by a simple web page editor. Then Netscape started to support plug-ins and animation elements to help bring forward the emerging web technologies.

It was a great browser, and it's one that we can fondly recall when we embarrassingly remember the first web page we ever made, complete with far too many animated GIFs and an awful layout. But hey, we were young.

Its History

Version 1.0 of Netscape was released in 1994 and was then known by the name Mosaic. Later, the Netscape brand was

added, and soon after, due to a legal battle, the Mosaic name was dropped, and the company behind the browser became Netscape Communications Corporation.

In the initial browser wars, Netscape was by far the winner, owning an impressive 90% of the internet share, with the only real competition coming from Internet Explorer. By the time version 3.0 of Netscape was released, the browser was enjoying its success, but with the release of Windows 98, Netscape's lead began to dwindle, thanks in part to Microsoft bundling IE with the operating system.

From 1996, Netscape became Netscape Communicator and was still holding its own against IE 4.0, but in 1998, Netscape Communications Corporation was bought out by AOL. Later that year, the Mozilla Organisation was formed to work on future versions of the browser, and although Netscape 6 was developed, it took another couple of years before it was released – unfortunately with some severe bugs.

Eventually, in 2007, Netscape Navigator 9 was released, but the damage was already done, and as a result a few months later, in February 2008, AOL pulled the plug, and the browser we once loved finally bowed out of the internet.

Did You Know?

- Netscape Communications Corporation made \$461 million in 1999.
- James Clark, one of Netscape's founders, used to smuggle whiskey before he gained a Ph.D in Computer Science.
- Mark Andreessen, the other founder of Netscape, wrote BASIC games at the age of eight.
- In 1995, Netscape was worth \$8.5 billion.

The Good

Fast, simple to use, surprisingly cutting edge for the time.

The Bad

Later versions were buggy, and the web moved on faster than development could handle.

Conclusion

Netscape, which eventually evolved in some part to Firefox, was a great browser and the main point of interaction we had with the emerging internet of the early 90s. And for that alone, we salute it.



▲ Netscape 1.0, back when the internet was a simpler place



▲ This was once a familiar sight across the world

Component Watch

Why look at your photos on a screen when you can print them out?

Printers: love them or hate them (we mostly hate them), you can't live without them. Not yet. Maybe one day. Of course, most modern printers are so cheap that it's barely worth looking for good deals on them. If you buy from the bottom end of the market, it's almost cheaper to buy a printer than it is to buy ink cartridges. But once you get to the more sophisticated devices – laser printers and all-in-ones – things get a bit more costly. That's why, in this week's Component Watch, we're looking for the best deals on exactly that sort of hardware.

Deal 1: HP Envy 4500

RRP: £74.99 / Deal Price: £49.99

This wireless AIO supports print, scan and copy functions, and provides what it refers to as 'lab quality' photo printing. Make of that what you will. Network support is good, though, with support for USB connections as well as AirPrint and Wireless Direct protocols, while the built-in Printer Control software helps you connect to other mobile devices. Automatic two-sided printing doesn't hurt either!

Where to get it: Currys – bit.ly/1Za4Msd



Deal 2: Brother HL-1110

RRP: £75 / Deal Price: £44.99

The Brother HL-1110 is one of the cheapest laser printers around, capable of 20 pages per minute in mono mode. With a 150-sheet input tray and 16MB of internal memory, it's good for small offices or heavy home use, especially when you consider that it lacks the frills of similarly priced inkjets. Still, if you have heavy printing to do and don't mind it acting like a printer of several years ago, it should suffice.

Where to get it: Box.co.uk – bit.ly/1m3XfwC



Deal 3: Canon Selphy CP910

RRP: £79.99 / Deal Price: £70.21

Despite being smaller and less feature-filled than the average printer, photo printers tend to be more expensive because of the

technologies involved, which are intended to provide a better-looking picture when all is said and done. The Canon Selphy range creates borderless prints using high-resolution dye sublimation printing, with built-in red-eye reduction. A great choice for making home prints.

Where to get it: Saverstore – bit.ly/1Ydk56v



Deal 4: Epson WorkForce WF-2630WF

RRP: £74.99 / Deal Price: £49.98

Designed for heavy home use and small offices, the Epson WorkForce range consists of inkjet all-in-ones with scanner, printer, photocopy and fax capabilities. While not quite as fast as a laser printer, it does manage 34 pages per minute, which is better than most printers can handle.

Its wireless functions include Google Cloud Print and AirPrint support, and there's an Ethernet socket for printing on a wired network. It's a bit more expensive than most AIOs, but the quality makes it worth it.

Where to get it: Staples – bit.ly/1Ydkl5z



Deal 5: Dell C1760NW Wireless Colour Laser Printer

RRP: £149.84 / Deal Price: £112.98

It's as cheap as colour laser printers get, but that doesn't mean it's particularly cheap. Even so, the Dell C1760NW is a good investment if you need to do a lot of high-quality colour printing. It's not the fastest printer at 15ppm, but its 150-sheet tray feed and network, USB and wi-fi capabilities mean it's convenient to use and shouldn't demand too much of you. Just watch out for those toner prices!

Where to get it: Ebuyer – bit.ly/1Rmqxnq





New Year, New You

Ergonomic solution to problem postures

Is It An After Eight Mint?

No, it's a camera. Obviously

The PR blurb for the iON SnapCam LE is nice. The accompanying press release suggested that the camera was "as small as an After Eight mint" which obviously brought back cruel recent memories of the festive season. Too. Much. Chocolate.

Anyway, the camera is ridiculously small, measuring 4.5cm squared, and it's light too, which is handy as it's a wearable camera that can be attached to your clothes using a clip or

magnet. The SnapCam LE records in 1080P HD at 30fps, takes 8MP photos and is a limited edition so there are only 20,000 available. If you're into selfies then you can always add the selfie stick casing to sort that side of things out, while key functions include time lapse and burst mode and it comes with built-in wi-fi and Bluetooth.

You can see the camera for yourself at uk.ioncamera.com and if you do want one, it will cost you £179.



COUGAR Keyboard For Premium Gaming

Looks quite nice, doesn't it?

Official COUGAR reseller Overclockers is promoting the COUGAR Attack X3 keyboard, a fully mechanical gaming board with Cherry MX switches and extremely fast response times.

Fully configurable, as you'd expect in a gamer's board, the aluminium Attack X3 has dedicated media keys and the on-board

memory allows up to three full configuration profiles to be stored on the keyboard itself, meaning you can take it with you to a friend's house without losing your settings.

The board has anti-slip rubber feet, a 1ms response time, 1000Hz polling rate and tactile feedback that promises to last up to 50 million keystrokes. Interested? Overclockers is the site to visit – www.overclockers.co.uk.



Desk posture is a perennial problem for many of us and the Varidesk Pro Plus 36 adjustable riser is a possible solution to discomfort.

The riser sits on top of your desk allowing you to switch from a seated to standing position and a lifting keyboard tray makes for ergonomic comfort whether standing or sitting. While the idea of

working while standing up is, let's be honest, a bit different there is evidence out there suggesting that standing for part of your working day can increase calorie burn and raise your energy levels and productivity.

At £350, it isn't cheap. If it does what it promises, though, then you could be looking at a healthier, more comfortable working solution. See it for yourself at uk.varidesk.com.



If you ever wanted evidence of how too much reliance on technology can be a bad thing, look no further than the emergence of autonomous cars. As Mark Oakley tells us, there have already been cases in this nascent market of incredible stupidity from some early adopters of the tech.

Okay, the people posting videos of themselves brushing their teeth or reading a paper while their car drives itself are doing it to make a point or for entertainment. But it doesn't take any great stretch of the imagination to think that as soon as this technology becomes more widely available, people will start doing these things in their everyday lives.

One day, I'm sure fully autonomous cars will be ready for the market, and they'll probably help to reduce accidents – particularly those caused by drunk or tired drivers. Lives will be saved, and that's great, but right now, this is a new technology, and it's only semi-autonomous, so the attention of the driver is definitely a requirement.

Until manufacturers can account for this level of idiocy, I just don't think these things should be on the road.

Anthony

Editor

Fastcut Evolves

Video editing made easy with Magix

The turkey has been well and truly devoured. Any last remnants of sprouts have been safely thrown in the bin. You've said goodbye to Auntie Mabel and you're already looking ahead to 2016. But wait! You've surely got to start work on the obligatory post-Christmas video. If that video is of a featuring or action-oriented persuasion (Christmas isn't just about lounging around the place, so we're told) Magix's Fastcut software could be the software tool for you.

Aimed largely at action cam users, Fastcut is billed as the "perfect solution" for amateur filmmakers wanting to create exciting, snappy videos. In truth,

this is your typical software upgrade on its initial release last year, with new features in the video editing suite including support for AVCHD camcorders, a redesigned UI for an optimised workflow and support for devices with high-resolution touch and two-in-one displays. The software can also be controlled using touch and swipe gestures while new H.264 hardware-accelerated decoding reduces CPU load for faster editing times.

The package comes with a editing templates for automatic editing with special effects, transitions and music to match your footage and throughout next year new templates and tools will be added on a regular basis. As an added extra, the software

ships with the proDAD Mercalli V2 image stabilisation tool and the finished videos can be shared in up to 4K resolution, directly online or to mobile devices. All of this for £30 over at www.magix.com.



Meanwhile... On The Internet...

That's it for 2016, then... So, as befits the passing of another year, it's time to round up some of our favourite 2016 *Meanwhile...* subjects into some kind of hybrid listicle-come-thinkpiece. Innovation, that's what you come here for... Sorry to disappoint you. Not that sorry, though, let's do it!

Left Shark Love

Let's go back to February, when Katy Perry's Superbowl half-time performance - spectacular though it was - was totally ruled by a faceless backing dancer by the name of Bryan Gaw in a shark costume (tinyurl.com/MMnet2015a)... Rather unfortunately for a man who makes his money from being on the beat, Mr Gaw's portrayal of 'Left Shark' on the night will always be remembered for appearing loose in its adherence to the choreography (tinyurl.com/MMnet2015b). His performance, combined with the goofy look of the costume and the absurdity of the whole situation obviously struck a chord amongst people, not least those among us whose attempts to dance could be described as uniquely interpretive, if you were being kind. A bit like Drake, really, whose *Hotline Bling* video must surely be the most parodied of the year (tinyurl.com/MMnet2015c).

Hello Adele

While we're on the subject of music, Adele has pretty much ruled the roost recently. She tore here way through the chat shows, leaving behind classics like the video of her dressing up as 'Jenny' in order to audition for a role as herself (tinyurl.com/MMnet2015d), and a wonderful performance with Jimmy Fallon and The Roots, backed only classroom instruments (tinyurl.com/MMnet2015e).

Everyone else wanted in on the success story, of course - whether it be pondering her use of a flip-phone (tinyurl.com/MMnet2015f) in the video to *Hello* (tinyurl.com/MMnet2015g), or straight up parodying the singer's mega-hit like James Corden (tinyurl.com/MMnet2015h) and Miss Piggy did (tinyurl.com/MMnet2015i).



Pharma Karma?

It's surely can't be easy to become widely labelled as 'The Internet's Most Hated', yet a man by the name of Martin Shkreli managed it this year. Initially infamous for being a the CEO of Turing Pharmaceuticals, a company that infamously acquired the rights to a 60-year old drug used by AIDS patients, and raised its price by 5,000% to over \$750 a dose, even though it costs around 65p per tablet in the UK (tinyurl.com/MMnet2015k). He then went on to defend the company's decision despite a massive social media backlash, and remained seemingly unrepentant despite the widespread indignation and media scorn.

Later on in the year, as if to troll the demographic that almost universally loathed him, and further shine the spotlight on himself in the wider media, it emerged that he had parted with something in the region of \$2m to purchase the only existing copy of the Wu-Tang Clan's *Once Upon a Time in Shaolin* (tinyurl.com/MMnet2015l) LP, making it the most expensive album in history.

That he has refrained from allowing the album to be heard in public thus far - despite there being an 88-year ban on him commercially exploiting his purchase - hasn't done his PR any good, either.

You can imagine, then, the level of schadenfreude that came bubbling up when it was announced that the so-called 'Pharma Bro' (tinyurl.com/MMnet2015m) had been unceremoniously cuffed and marched off by the police in relation charges of fraud (tinyurl.com/MMnet2015n). It wasn't pretty, we have to say... But you could kind of see where it was coming from.

Dope Pope

It's childish, we know, but the #PopeBars meme (tinyurl.com/MMnet2015o) was an almost perfect example of social media at play; where almost any picture can spread like wildfire and trigger comedy by the bucketload. So, it came to be that a simple Getty Images picture of Pope Francis clutching a wireless mic came to endlessly recaptioned with rap lyrics. Genius (tinyurl.com/MMnet2015p).



Over The Chill?

If you've not come across the phrase 'Netflix And Chill', you're probably older than 30, or more the 'Amazon Prime And Commitment' type (tinyurl.com/MMnet2015q). We'll leave you to look it up (tinyurl.com/MMnet2015r), we're likely to blush if you make us try to explain... Is it warm in here?

The John That I Want

As far as the internet is concerned, John Travolta is the gift that intermittently gives it comedy gold. 2014 bought us his Adele Dazeem moment (while introducing actress/singer Idina Menzel (tinyurl.com/MMnet2015s), and late this year we turned back to him as the everyman to best represent our moment of confusion (tinyurl.com/MMnet2015t). Oh John, we know how you feel.

And with that, we wish you a happy new year. May 2016 bring us many more funny and interesting things to chat about... Bye bye 2015, it's been a blast.

Caption Competition



This chap was the subject of our Caption Competition in issue 1392; here's what you came up with:

- **doctoryorkie:** "Smart Screen couldn't prevent this."
- **doctoryorkie:** "Doctor, doctor I think I've got a telly on my head... OK I'll monitor your condition."
- **Terry Martin:** "Having bought a job lot of old CRT monitors, Dodgy Dave fails to sell them as retro headgear."
- **doctoryorkie:** "Doctor, doctor I think I've caught a VDU."
- **Thomas Turnbull:** "I hope I didn't get this IT job just on my looks."
- **Dwynneugh:** "It's better than a brown paper bag, init?"
- **JayCeeDee:** "You know when you asked if I'd been on the telly?"
- **JayCeeDee:** "When the doctor said he wanted to monitor my head, I never thought he meant this."
- **Thomas Turnbull:** "Can you go over there and C R T is ready I fancy a cuppa."
- **Thomas Turnbull:** "That's the last time I'll argue with our head of IT."
- **doctoryorkie:**
- **Greg Dixon:** "Please don't ask if my head hertz."
- **Leigh Spriggs:** "My boss told me to display my ideas."
- **Alison Gear:** "In a display, no one can hear you screen."
- **Lee Green:** "Jim was more than a little perturbed by his employer's screening process."

Thanks to everyone who entered, but the best of the week was doctoryorkie with "The wife asked 'What's on the telly?' I replied 'dust'."

To enter this week, come up with something to accompany the picture below, head to the 'Other Stuff' section of our forum (forum.micromart.co.uk), or email us your funnies via caption@micromart.co.uk, remembering to add the issue number to the email subject line. Happy New Year!



Hannspree Offers "Best" Touchscreen Monitor It Has

They said it

Hannspree is clearly very pleased with its new HannsG 27" touchscreen monitor, describing it as "Hannspree's best". So let's take a look, shall we?

The HT273HPB features IPS display technology delivering 178° viewing angles, advanced ten-point touch control and Full

HD resolution. With a contrast ratio of 1000:1 (80,000,000:1 active contrast), anti-glare panel surface and a Brightness rating of 300cd/m², the monitor also comes with built-in stereo speakers and VGA and HDMI outputs.

Hannspree's website can be found at www.hannspree.co.uk, and the cost is £279.



AMD's Zen Processors Coming Next Year

Media reports suggest launch is indeed happening

You have quite possibly been waiting for more news on them and now it seems that AMD's Zen processors should indeed be coming to high-end PC systems next year.

According to reports, AMD's chief financial officer confirmed at a conference that the range would be introduced in 2016, which should be welcome news to AMD fans waiting to show off their wares to their Intel-loving rivals.

Snippets!

SoftMaker Goes Linux

We told you a little while back about SoftMaker Office 2016 for Linux's public beta. Well, now that's complete and the product is shipping.

The full office suite is available for £45 (for the Standard version, £65 for the Professional) and promises 400 new features, a new level of compatibility with Microsoft Office, and better performance that's up to five times faster than Microsoft Office. With a word processor, spreadsheet and presentation programs, the suite is compatible with all modern Linux distributions and each package comes with three licences.

YouTube's Most Viewed

Can it be that clips from television talent shows have become the go-to videos of YouTube these days? In the UK, auditions on Britain's Got Talent gained two entries in the top ten most-viewed of 2015, sitting alongside the teaser trailer for *Star Wars: The Force Awakens* and an advert for *FIFA 16*. Globally, the most-watched YouTube video for 2015 was a dance choreography video featuring a young girl Heaven King and her friends performing in New York that was either quite sweet or really annoying, depending on your point of view. Either way, it garnered itself well over 119m views.

Time Up For Mayer?

At the time of writing, Marissa Mayer's job at Yahoo was a looking like it was on a little shakier ground than it was at the start of the year as a Yahoo shareholder had presented a lengthy recommendation suggesting ways for the company to turnaround its fortunes. One of the suggestions? Get rid of tens of thousands of employees, including Mayer.

Reading Workshop Helps EDSAC Reconstruction

Step forward, Mr Barr

For all its outstanding work in the reconstruction of the EDSAC machine, one of the world's earliest computers, even The National Museum of Computing needs a little help now and then. Let's take a moment to acknowledge the brilliant work of James Barr, owner of a workshop in Reading that is assisting in the reconstruction.

Barr is quite the computing specialist and has something of a personal connection to EDSAC. During his studies at Cambridge University back in the 70s, he was taught by Sir Maurice Wilkes, the designer of EDSAC. What an honour. After university, Barr worked as a computer programmer and although he retired in 2012, he still felt he had something to offer.

In his 'Edshack', Barr is reconstructing key components of EDSAC's central control system (he's

one of only a few who would have the knowledge) – we're talking thermionic valves that were used for war-time RADAR and preceded the invention of transistors and silicon chips. Having done his research, Barr's efforts are clearly much appreciated by the Museum. Andrew Herbert, leader of the EDSAC project, said: "Edshack is one of several home workshops across England that are being transported back in time as they play their part in the reconstruction of EDSAC."

For more on the project, type the following into your browser of choice www.tnmoc.org/special-projects/edsac.

➤ *Courtesy of the EDSAC Project*



Back Up!

Acronis issues a warning

The chances are that over the festive season many of you reading this will have met up with friends and family a-plenty, taking lots photos and videos for posterity. The importance of keeping those digital memories safe is obvious but it's a good time of the year to remind everyone of the basics nonetheless.

Here is some six-step advice from the director product marketing at Acronis, Sandra Adelberger:

- 1)** Schedule regular backups. Start with an initial full backup of the entire system and then set up automatic, incremental backups. This saves disk space and decreases the time each backup runs.
- 2)** File backup is not enough, protect your whole system. Windows is a complex operating system and

some data – like passwords, system settings, and applications – lives outside of files.

- 3)** Use dual protection. Protect your important data twice by backing it up to the cloud as well.
- 4)** Test how recovery works, before a disaster strikes. Testing the backup is important to see if the backup really worked or if there were any unknown issues that happened during the backup process.
- 5)** Always make sure your system is well-protected before any installation.
- 6)** Watch out for reliable data encryption in case of third-party usage. If you store your data on third-party services, don't rely on tools with little or no encryption, otherwise you provide unintentional access to anyone on those servers sometimes without even knowing.

HyperX Turns Savage

New Flash drive joins the gang

Kingston's HyperX division has launched the Savage USB Flash drive, an addition to its Savage line of products.

The slim USB 3.1 drive operates at transfer speeds of up to 350MB/s read and 250MB/s write, and is available in 64GB, 128GB and 256GB capacities (the 64GB model comes with 180MB/s write speeds). Featuring a nice

design with its sleek black casing and metallic red HyperX emblem, the Savage USB Flash drive is compatible with the latest desktops, notebooks, the PS4 and Xbox One consoles.

As ever, you need to go to **www.hyperxgaming.com** for more details.



OneDrive Storage Call Reversed

Existing users can opt out

Remember back in November when Microsoft said it would be cutting down the free OneDrive storage from 15GB to 5GB? If you're a user, we're sure you do as the announcement wasn't exactly met with glorious praise.

Now, though, Microsoft appears to have listened to

dissenters... kind of. Current OneDrive users can now choose to opt out of the changes that are coming in next year. They will receive an email containing a link to retain the 15GB storage limit, as long as they do so before the end of January so if you haven't had the email yet, you could always go to **[preview.onedrive.com/bonus](http://onedrive.com/bonus)**.

Microsoft Goes Open Source With Live Writer

Live Writer Lives! It really lives!

Yes, a group of volunteers within Microsoft has announced that it has successfully open sourced and forked Windows Live Writer. Blogging on the matter, Microsoft employee Scott Hanselman wrote that the fork, part of the .NET Foundation, is up and running and that "if you're willing to put up with some bugs, then join us in this brave new world, you can download Open Live Writer", pointing people towards **www.openlivewriter.org**.

Among the changes are the removal of spell checking and the Albums feature, while coming to Open Live Writer will be a soon-to-be-added new authentication system that has come about thanks to a helping hand from Google's Blogger team. Nice to see Google and Microsoft helping each other out now and then.

If you were a user and fan of Live Writer before Microsoft stopped updating it a few years back, this should all come as welcome news.

MFC-L2700DN

Focusing on the office, Mr Fereday checks out a new all-in-one

DETAILS

- Price: £119
- Manufacturer: Brother
- Website: www.brother.co.uk
- Requirements: Windows XP and later with 1.85GB of hard disk space or Mac OS X 10.7.5 and later with 480MB of hard disk space



Designed for office use, the MFC-L2700DN is an All-in-One device. Based on a mono laser printer, this product combines Fax, Scan and Copy facilities with an ADF (Automatic Document Feeder). The 'DN' of the product's title indicates that you also get Duplex and Networking capabilities.

Rather dull looking, with its gun-metal and black colour scheme, the MFC-L2700DN has dimensions of 409 x 398.5 x 316.5mm (W x D x H). The make up of this device follows the standard layer arrangement of a paper tray, printer, scanner and ADF modules. Along with the 250-page capacity main paper tray, there is also a manual feed slot positioned below the main paper output opening. When printing thicker material, such as envelopes and card, you can opt for a straight-through paper path with the exit from an opening at the rear of the unit.

Positioned along the front of the A4 flatbed scanner is the unit's control panel. There are buttons for various Fax operations, plus those for switching between the Fax, Scan and Copy modes and navigating through the unit's menu system. Providing status

and feedback information is a 2" LCD screen. I found it particularly difficult to make out the messages that were being displayed on this screen even with the contrast level turned up to its maximum.

The print driver supplied with this model offers three quality levels, identified by their 300, 600 and 1200 dpi settings. Options including paper type and size plus whether to implement the

message direct from the scanner bed or use the ADF module when multiple pages are involved. Group mailings are possible using the 200 numbers that can be stored in the available memory. There is also a facility to store often used Fax numbers in a quick dial feature.

The A4 flatbed scanner can produce images at up to 600 x 2400 dpi when delivered direct from the scanner's glass plate. However if the ADF feature is used, when producing photocopies, then the resolution drops to 600 x 600 dpi. Scanned images sent to a computer can be saved and stored in PDF format.

Remote scanning and printing is possible using the free Brother iPrint&Scan app or AirPrint. You can also send and retrieve documents from the Cloud with the help of various compatible apps.

Currently Brother is listing replacement toner cartridges at £44 for the 1200 page standard variety or £73 for the high yield 2600 unit. A replacement drum unit is priced at £83.

mm Michael Fereday

“ I was able to duplicate the promised print speed at all three quality levels ”

After first inserting the supplied toner cartridge into the drum unit residing in the printer's insides, you can install the necessary drivers and bundled software. As part of this process, you will need to decide whether the Brother device connects to a computer, either Windows or Mac, via USB or Ethernet network. In both cases, the connection is at the rear of the all-in-one and you will need to provide the necessary lead. Once the on-screen instructions have been followed, a system restart will be required.

Duplex mode and booklet style layouts are available.

Using a 500-word text document I was able to duplicate the promised 24ppm print speed using all three quality levels. With Duplex turned on, a 6050-word document was printed on both sides of six pages in 59 seconds. Using the ADF feature, a six-page document was photocopied in 28 seconds. Print quality was good in all cases.

When using the Fax facility you can dispatch a single page

A capable all-in-one device for a small or home office



Emsisoft Anti-Malware 11

If you are looking for a new antivirus program, this one should be on your shortlist. Roland Waddilove checks out the latest version

DETAILS

- Price: £28
- Manufacturer: Emsisoft
- Website: www.emsisoft.com
- Requirements: Windows 7, 8, 10, 1GB RAM, 1GHz processor, 300MB disk space.

Emsisoft Anti-Malware is a lightweight antivirus program for people that do not need a full security suite with all the bells and whistles. It provides a basic level of protection against viruses, spyware and other types of malware, web protection, and a behaviour blocker. It costs £28 for one computer for one year, but three computers work out at £14 each. There are additional discounts for two or three year licenses.

The software looks the same as it did last year, but there have been changes below the surface to improve the performance and protection. Anti-Malware now detects zombies. Not The *Walking Dead* variety, but the hijacking host processes to load malicious code kind.

Ransomware has become increasingly common, where malware encrypts the disk until you hand over a huge sum of money to thieves. This latest Anti-Malware is better at detecting and blocking ransomware activities. It is quieter than previous versions and will often deal with malware without asking you what to do. It just does it.

One change worth mentioning is that support for Windows XP has been dropped and Anti-Malware needs at least Windows 7 with service pack 1. There



▲ The interface is mostly unchanged from last time, but the scanning and detection has improved

aren't many XP users left, but if you are one then you must look elsewhere for protection.

The interface is plain and simple. There are four tiles consisting of Protection, Scan, Quarantine and Logs. The Scan

PCs in the home or office. It automatically allows programs with a good reputation and blocks those with bad ones. The File Guard component can be customised and there are three settings, fast, balanced and



▲ Behaviour analysis enables Anti-Malware to spot potentially unwanted programs and block them

Vipre, but it wasn't as good as Kaspersky or Trend Micro. It is a good security program, but it is not the best. Anti-Malware is available with a firewall for an extra £15 as Emsisoft Internet Security and it is free without real-time protection in the form of Emsisoft Emergency Kit, which is useful for scanning and cleaning up an infected PC. It is a competent anti-virus program, priced similarly to rivals and the performance is reasonably good.

mm Roland Waddilove

“ It is a competent anti-virus program, priced similarly to rivals ”

screen is a bit confusing, though, as there are Quick Scan, Malware Scan and Custom Scan options. Don't they all check for malware? A Malware Scan is basically just a full scan. Custom scans can be created and you can set various options, such as searching for PUPs, scanning for rootkits, and so on. There is a useful option to use direct disk access, which is a better, but slower way to access the disk and find rootkits.

If malware is detected, Anti-Malware can send you an email, which is useful if you install it on other computers, such as other

thorough. You can choose what to do with PUPs (potentially unwanted programs), such as alert or silently quarantine.

Web browsing checks look for hosts known for phishing, malware and PUPs. There are four options: allow, block, notify or carry on silently. Websites can be blacklisted, but it is hard to see the benefit.

Emsisoft Anti-Malware performed quite well in AV-Comparatives real-world protection tests in October 2015. It beat Lavasoft, McAfee, Bullguard, Avast, ThreatTrack

It's not too expensive and performs quite well. It's worth considering.



Adam Elements ROMA 64GB

Adam Elements provide proof that the USB Type-C floodgates are opening

DETAILS

- Price: £39.99
- Manufacturer: Adam Elements
- Website: tinyurl.com/qbkn5yf
- Requirements: Standard USB port (ideally USB 3.0 or 3.1) or USB Type-C

I'm a complete sucker for classy looking technology, and the ROMA by Adam Elements certainly fits that bill. Its precision metal finish and leather strap elevate it well above the plethora of plastic devices we're pushed by other brands. My only initial concern was that like many Apple-related products there would be a major cost implication to this level of build quality. Amazingly, at least based on the MSRP I was provided, this is quite competitively priced for a 64GB flash drive. Adam Elements also plans a 128GB model in the near future, though I've no pricing for that currently.

I mentioned Apple earlier, and coincidentally this drive is going to be popular with new MacBook owners first. Because, in addition to the usual USB interface, the Roma rotates to reveal a USB Type-C port, as used on Apple's latest hardware.



I've seen a few of these either/or designs before, but usually they fail rather miserably in delivering good speed over normal USB, but rubbish performance over USB Type-C. Thankfully, that's not a problem with the Roma.

Having tested this one, the ROMA breaks that losing streak, by being as quick over USB Type-C as USB 3.0, making it a potentially perfect companion for anyone with both ports on their equipment.

The makers claim that the Roma drive can achieve 130MB/s, though initially I had some difficulties getting it to go that fast. Some system tweaking later it achieved that speed – and better using USB 3.1 and the Type-C connection.

Or rather it did at reading, because at writing this drive is rather disappointing at about 20MB/s. That makes it ideal for distributing installations and data to devices, using either connector, but slow at getting the files on there to begin with. How much of an issue that is for you depends on how you use these things, but for someone wanting to catch and early train home after dumping his work files to it, the ROMA might not be looking so ideal now.

Having used this drive for a while I've only one other minor complaint against it beyond its slow writing speed. And that's the rotational mechanism, which ironically moves far too smoothly. That can cause it to twist while you are trying to insert the drive.

What it really needed was a dimple with a small sprung bearing so that when just twisted it around it locked in each of the selected directions. Other than that minor point, it's a great design that looks wonderful with its personal grooming aesthetics and unique styling.

My only hope is that Adam Elements can follow up the Roma with a design that allows the write speed to reach speeds that are better than the measly 15% of the read performance it's currently offering. If that became the case, then I'd have absolutely no qualms about recommending their products.

However, for the first Adam Elements device I've covered, there was plenty to like here. What's for sure is that I'm excited to see more from them in the future.

mm Mark Pickavance

Dual USB port support and a decent read speed

ROMA 64GB

- Dual Interface: Type-C USB and USB 3.0 connectors
- Capacity: 64GB
- Swivel-Cap design, no worries on losing cap.
- Premium Zinc alloy and aluminium casing
- Compatible with USB Type-C enabled MacBook, Chromebook Pixel and devices
- USB 3.1 performance for speeds up to 130MB/s
- Genuine leather strap included



Western Digital My Cloud 2TB

Western Digital spreads some sunshine in a cloudy world

DETAILS

- Price: £100
- Manufacturer: Western Digital
- Website: wdc.com/
- Requirements: Ethernet Network

Many people have an issue with 'the Cloud', or rather their lack of control over personal information stored out on the Internet. Given the poor attitude that both security services and commercial companies have to privacy these days, that's probably not being paranoid.

The alternative, partly, is to have your own Cloud service, where you can centralise your files on an Internet accessible device that is located in your own home. That's precisely the thinking behind Western Digital's My Cloud range, and the entry level My Cloud 2TB is the first rung on this ladder.

This is a single un-removable drive encased in a white plastic shell, styled to look like a bound book. The review device was a 2TB capacity model, though you can also get them with 3TB, 4TB and 6TB drives installed. Starting at just under £100, the best value is probably the 3TB model, looking at the small cost difference from the 2TB.

Getting the My Cloud working is just a matter of plugging it into



your router using the provided Ethernet cable and connecting the small power block.

There is no power button, so the My Cloud boots immediately, and shortly afterwards you can see it on your network and access it via a web interface. The MY Cloud OS will be familiar to anyone who has used any of Western Digital's NAS solutions in the past couple of years. It's a very clean design that boils down the information to just the barest essentials; users, shares and controlled Cloud access.

Inherently the system is a DLNA 1.5 and UPnP server, and it's also an iTunes and Time Machine service. What really blew me away, however, was the speed of file transfers; it

hit 111.9MB/s reading and (a less exciting) 46.3MB/s writing. Through repeated tests I achieved slightly better writes, but the read speed was consistently great.

For remote access and wi-fi the speed is more than adequate, and there are a selection of iOS and Android apps to enable you to both remotely read and write data. There is also a selection of free software apps for Windows, though you could use any network aware tools to achieve the same results.

Of the branded utilities, probably the most useful is WD Sync, as you can use it to replicate specific folders from the PC to the My Cloud, and conversely to other computers. This tool works surprisingly well, and even allows for versions of updated files to be retained.

Once you've used up the available capacity there isn't any way to upgrade the internal drive, but there is a USB 3.0 external port on which you could hang a My Passport drive potentially.

One oddity with this port is contrary to almost every NAS box solution out there, it can't be used to share a printer. That choice seems in line with the general push to simplification, and there aren't any box installable apps either.

If you want an affordable personal cloud product then the My Cloud is a strong candidate, though you might want something more flexible down the road. **mm Mark Pickavance**

A nifty NAS box and personal Cloud in one



The My Cloud Product Range

| Models | Size | Cost |
|----------|------|------|
| My Cloud | 2TB | £100 |
| | 3TB | £120 |
| | 4TB | £149 |
| | 6TB | £299 |

Humax Freesat HDR-1100S

Mr Fereday has been channel hopping with a new Humax box

DETAILS

- Price: £180
- Manufacturer: Humax
- Website: www.humaxdirect.com/uk
- Requirements: n.a.



The Humax Freesat HDR-1100S brings together a choice of over 200 entertainment channels delivered into the home via a satellite dish, on a no subscription basis, with a hard disk that has built-in EPG facilities. Models of this particular device are available with 500GB, 1TB or 2TB of storage capacity. This review is based on the 500GB unit.

As this set-top box is meant to form part of the home entertainment system available from the living room, its appearance needs to be suitable for its environment. Humax has come up with a box, available in either glossy black or white, that has sleek curved lines enhanced with a silver trim. It certainly puts to shame the sky box that sits beneath my television.

The box has dimensions of 280 x 48 x 200mm (W x H x D) with its top surface embellished with Humax and Freesat logos. Arranged along the front are slightly raised controls for volume adjustment and channel selection. In most cases I feel that these controls will be redundant as many users will prefer the more relaxed method of control by using the supplied large style remote unit from the comfort of an armchair.

This set-top box adopts the standard practice of keeping its main connection options out of sight at the rear. Here you will

find two screw-in connections for linking the box to the signal-delivering satellite dish. Other connections include those for HDMI, USB, audio / video and Ethernet plus a power socket. Humax has recently added wi-fi connectivity to this product. Whether using Ethernet or wi-fi, Internet access is a requirement for some of the product's functionality such as Roll Back and On Demand.

Setting up the box is straightforward with illustrated diagrams in the Quick Start Guide being available. Once the necessary physical

connections have been made, on-screen instructions will lead you through the rest of the process as you enter your post code via an on-screen keypad so that regional services for your area can be made available. You might also want to apply some security features that will apply to the type of content that will be available to the younger members of the family.

A four-digit PIN can be created to control access to recordings and On Demand features you feel are unsuitable for younger eyes. There is also an option to trim the listing

used by the TV Guide service by removing all channels that have been classified as iAdult. Even with such channels removed there should be plenty of choice as over 200 channels are available.

The Home screen is the main starting point for your entertainment needs. Along with the TV Guide, you can access On Demand catch-up services including BBC iPlayer, ITV Player, All4, Demand5 and YouTube plus all the content stored on the unit's hard disk. Reminders can be set up, as can the creation of viewing schedules which can then be revisited at a later date to remind you of the items selected.

You can access information relating to specific programmes and search for content using criteria based on channel or genre categories. For those recordings you wish to keep, for whatever reason, you can add a tag to ensure they are not accidentally deleted. You also have the ability to pair the HDR-1100S box with a Freesat app giving you the ability for remote viewing and planning purposes.

mm Michael Fereday

A stylish box for watching, recording and managing Freesat content.



Penclic Mouse R2

A new design for a more comfortable peripheral

DETAILS

- Price: ~£60
- Manufacturer: Penclic
- Website: goo.gl/fQLys7
- Requirements: OS independent, spare USB port for the wireless dongle

Although the modern mouse has gone through a number of evolutionary stages – adding a scroll wheel, using a laser or optical sensor to track movement, and including a number of other useful buttons – the overall design hasn't changed all that much.

One of the main concerns for the modern worker with regards to this design is the onset of RSI, Repetitive Strain Injury. Let's face it, holding a mouse with your palm held flat for eight hours plus a day can lead to some painful and long-term problems. Thankfully there are ways to help prevent RSI, but a Swedish company, Penclic, may have a better solution.

The Penclic Mouse is a re-design of the traditional mouse without losing any of the peripheral's functionality. There are a number of different versions available, with corded, wireless and Bluetooth connectivity covered, however, the model we have on test today is the Penclic Mouse R2, the wireless version.

The Penclic mouse has been designed to be a natural extension to the movement of the hand; a more comfortable and ergonomic solution that utilises the hand's natural dexterity to create a healthier working position.



▲ The Penclic will eliminate RSI due to its unique design

▲ However, it's not quite as accurate as a traditional mouse

It looks and feels like a pen, which essentially it is, albeit one that's attached to a small base via a ball joint where it's free to move around as you rotate your hand and wrist. The base is the actual mouse optical sensor part, and works in very much the same way as a normal mouse does. On it you'll find a scroll wheel, with a

triple-A rechargeable battery, the aforementioned wireless USB dongle, a retractable micro USB to full sized USB cable, and a multi-language quick start guide and instructions.

The design is certainly unique, and in all honesty it does take a little time to get used to the movement of both the pen part

In terms of comfort, the Penclic is quite remarkable. The feeling of holding a pen is more fluid and completely cuts out the unnecessary wrist strain normally associated with a traditionally designed mouse. However, it can be quite awkward at times to get the same level of accuracy as a traditional mouse.

While an ideal solution for those who suffer from RSI problems, this design isn't something you'd choose for everyday use. It's a fantastic product, we like the fact that it's OS independent too, but it's probably just a little too inaccurate for detailed work.

mm David Hayward

“ It takes time to get used to the movement of both the pen part and the base ”

triple-A battery compartment underneath alongside a power switch and connect button – to communicate to the wireless USB dongle that comes with it

The pen houses an array of buttons along the bottom half where it joins with the base. These include left and right click, middle click, back and forward, all encased and mounted on to a rubberised section.

In the box you'll find the Penclic itself, along with a

and the base. As default the DPI settings are at the maximum 2400, but by holding down the left and right buttons for a few seconds the Penclic will drop through the other DPI values: 800, 1200, and 1600.

Setting a lower DPI to begin with is probably the best way to get used to the movement. After that you can slowly up the DPI settings according to how quickly you become accustomed to the device.

A superb anti-RSI mouse, but a little awkward



Edifier CineSound B3 Soundbar

Spice up your TV and video enjoyment with this sound bar from Edifier

DETAILS

- Price: £ 150
- Manufacturer: Edifier
- Website: www.edifier.com
- Requirements: A sound source via Bluetooth, Optical or a 3.5mm stereo jack

TV's offer good imagery, but are not so good at enriching the experience with quality audio.

Towards the end of CRT production, the large cabinets allowed the installation of fairly decent speakers, so these heavyweights were getting closer to what might be called Hi-Fi. However the latest slimline TFT and Plasma TV's simply don't have the real-estate available to fit decent speakers into their ever thinner cases.

Consequently many people turned to surround sound systems to improve the sound output, yet these have also fallen out of fashion; to be replaced by sound bars like this latest release from Edifier, the CineSound B3 Soundbar.

It's a rather smart looking unit, that's basically a mains powered metre long enclosure, fitted with four speakers and two tweeters. These combine to widen the sound output, producing a rich, full and distortion-free sound to compliment the video your new Smart TV is capable of.

Incidentally if you're one of those people who feel that the cloth covering in front of the speaker impedes the sound quality, you're in luck, because B3 Cinesound's is removable.

Moving to the side profile you'll see it has four small circles with associated legends; these provide the on/off, volume and mode



controls. While we're on the subject modes are simply preset sound settings, designed to give the best experience while listening to different genres of entertainment. The default mode is Movie, which for my room and the music I play, suited me best; there are others to choose from.

While the sound from this unit is a marked improvement on most integral systems, it doesn't have the powerful bass element you'd get from a dedicated bass speaker. Having said that in all the tests I did it performed faultlessly; there is no discernible hiss at any volume, or any induced electrical distortion while changing the volume itself. In fact the overall output is superb; and if you want to ramp up the volume, the unit can be used at its maximum settings without overdriving the speaker cones.

The Edifier designers have not stinted on the input options either; you have optical, coaxial, line in, AUX in and, if you want to add a more powerful Subwoofer, a sub out socket. Here again it's clear that some thought has gone into the design, because the connections sit in quite a deep cut-out under the unit, which of course protects and to some extent hides the cables. One other important feature of this speaker is it's built in Bluetooth connectivity; which naturally adds another potential use for it. Like other Edifier speakers I've reviewed, this is straightforward to use and pairs with my Smartphone or iPod in seconds.

To complete the package Edifier has provided a small handset, so you don't have to leave your chair to change the input and output modes, or indeed the volume.

Unusually they've also included a high quality fibre optic cable, a twin RCA plugs to 3.5mm jack audio cable, and a 3.5mm socket to twin RCA plugs cable. Together they cover just about any input combination you might have.

Finally, the unit ships with quite a sturdy black powder coated steel bracket, so you can hang it on the wall below or above your TV. Certainly a logical way to mount it, particularly if your TV is already fitted with a wall mount. Alternatively you can simply stand it in front of your TV, where the rubber strips on the bottom keep it firmly in place regardless of the volume setting.

mm Joe Lavery

An excellent way to improve your TV or media player's sound quality

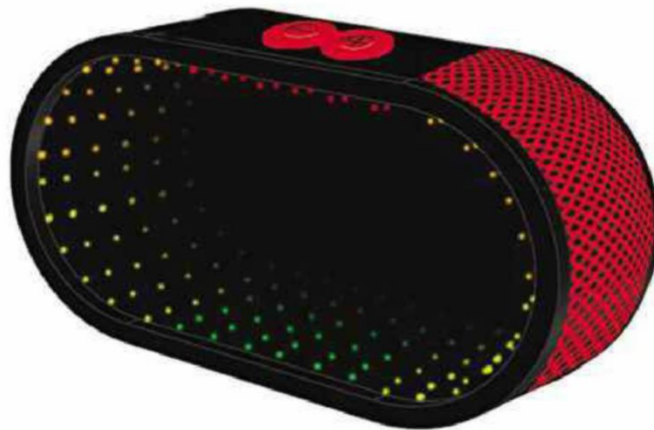


Infinity Bluetooth Speaker

Michael Fereday journeys to infinity to check out a light show

DETAILS

- Price: £43
- Manufacturer: Thumbs Up!
- Website: www.thumbsupuk.com
- Requirements: n.a.



With the number of small-to-medium Bluetooth speakers currently on the market, manufacturers are looking to different ways to make their product stand out from the competition. Attractive packaging and adding extra functionality are just two ways I have noticed recently. Thumbs Up!, the company responsible for this next offering, has gone for the latter method by introducing a light show feature to its Infinity speaker.

With dimensions of 170 x 87 x 55mm (W x H x D) and weighing 360g, this oval shaped device is perhaps not the ideal size or shape for slipping into a pocket but a bag would suffice. I was a little disappointed that Thumbs Up! had missed a trick by not including one in the box along with the supplied USB and audio leads. One reason for my disappointment was that a cloth bag could double as a cleaning option to remove the finger smears that build up on the front surface, which was a mirror, of this Infinity speaker.

Why, you may ask, have they built a mirror into this device? The answer is that this mirror, along with the ten lights surrounding it, and the built-in LED Equalizer, are meant to deliver the promised light show effect as the music inspires light flashes

disappearing into infinity (the concept not the device). Again I was disappointed.

While I was not expecting something as visually impressive as the Morecambe lights, that were a regular family trip when I was growing

up or move this speaker without leaving behind a calling card that would stand up in court behind you. In this respect the device was top of the class.

Covering most of the Infinity speaker's body is a

cycle backwards and forwards through Bluetooth supplied tracks. Unfortunately these controls have been arranged to form the infinity symbol with the result that they are rather close together. I often found that my clumsy fingers would hit the change track control rather than volume adjustment which did become annoying after a while.

If you can put up with the disappointing light show and awkward control layout, then you can look forward to reasonable audio quality with impressive battery performance. Do not, however, expect the Infinity unit to double as a speakerphone; unlike many Bluetooth speakers, it does not have this capability.

mm Michael Fereday

“ The mirror made an excellent repository for finger smears ”

up, the Infinity light show was extremely pathetic to say the least. On some occasions there was not even a flicker and it was not until I switched to a wired, rather than Bluetooth, connection and turned the volume up that some intermittent flashing occurred. I could ascertain no actual correlation between the tempo of the music being played and the lights being reflected in the mirror, though.

While offering little evidence in terms of a light show, the mirror made an excellent repository for finger smears. It was almost impossible to pick

black, compressed, rubberised material with integrated metallic grills at each end for the two 3W speaker units. Sockets on the rear of the unit are available for linking non-Bluetooth audio devices and charging the unit's internal 1200mAh Lithium battery which, almost as if to compensate for the poor light show, provided over 18 hours of reasonable playing quality from a single charge.

Arranged on the top of the unit is the Infinity speaker's control panel. There are options to stop/start, increase/ lower the volume level plus

A mixture of good clear audio but poor light show effects



GROUP TEST

E-readers

E-readers took the world by storm a few years ago and have since become must-have devices.

But times have moved on, and with a new generation of more powerful and lightweight tablets available, is there still room for the e-reader?

We have a look at six and see if there's still life in this old device.

E-readers

Amazon Kindle Paperwhite

DETAILS

- Price: £109
- Manufacturer: Amazon
- Website: goo.gl/NPGM1T
- Requirements: Amazon account for e-book store

This is something like the seventh generation of the Kindle range of e-readers from Amazon, and it looks like there's no slowing down in the technology despite the availability of newer, lighter tablets.

The 2015 Paperwhite is pretty impressive. At just 205 grams for the wi-fi version (217g for the wi-fi and 3G version) and measuring 169 x 117 x 9.1 mm, this lovely device is capable of storing several thousand books thanks to its 4GB internal storage.

Battery life is noted to last up to six weeks, based on a half hour of reading every day (with the wireless turned off and the light settings lowered), but there's a distinct possibility it won't be able to stretch that

far. In our test, we noticed the drain on the battery to be quite severe, especially when we first opened a book or opened a new book.

The wi-fi uses 802.11 b/g/n, with support for WEP, WPA, WPA2 and WPS, so you should be able to successfully pair it with pretty much every wireless hotspot and network on the face of the planet. Finally, the list of supported e-book formats is vast, but it includes AZW3, TXT, PDF, HTML, DOC, DOCX and MOBI.

Being a 6" reader means it mimics the rough dimensions of a book better than some of the previous models of Kindle or some of the earlier Kobo models. It feels good to hold, light – although not as light as some other readers – but not fragile either, and the matt-black finish helps it look as well as feel more comfortable and pleasing to the user.

However, the real star of the show is the Carta 300ppi e-paper technology in the screen. Exclusive to Amazon, it offers something in the region of a 50% improvement to the contrast ratio and a 20% improvement in the



reflectance. Indeed, the text is clear from a multitude of angles and is readable even in direct sunlight. It's crisp, sharp and, if we're being honest here, looks better than the text in a real book in some cases. The backlight is also softer and when reading in darker conditions, it doesn't put too much strain on your eyes, and you don't have that 'ghosting' effect after you close your eyes at night either.

It's also an extremely fast e-reader and is ready to be used within seconds from turning the device on. Navigation of the core system is also fluid and quick, and the touchscreen is as responsive as you would expect from a high-quality product.

The only downside is the advertising from Amazon, which can get a little annoying; these adverts can take up the lower portion of the screen and are mostly recommendations based on your current selection of books and what you've previously browsed. The Amazon cloud is featured heavily here and it's clear that's the direction Amazon is forcing you in. But in the long run it's not all that bad, and if you ignore the initial recommendations or you really don't mind them, then you're in for a real treat with the Kindle Paperwhite.



▲ The 2015 Amazon Kindle Paperwhite is a superb e-reader



▲ Think of Amazon what you will, but the Kindle still sets the bar high

Ectaco jetBook Mini

DETAILS

- Price: £129
- Manufacturer: Ectaco
- Website: goo.gl/D2yhFS
- Requirements: Four AAA batteries

The Ectaco jetBook Mini is the more modern version of the ill-fated Ectaco jetBook Color Deluxe, a larger 9.7" e-reader that tried so hard to be an all-in-one educational reader, but which failed at nearly every step. Has the company been able to improve things since then?

It has a 5" 640 x 540 display, with 16-levels of greyscale and a featured 'no glare' technology. It measures 116 x 126 x 20mm at its thickest point, dropping to 10mm at the thinnest part. It's reasonably pocket-sized, but the design is really quite awkward, with an almost game controller look to one end of the device.

The jetBook Mini comes with 2GB of memory, 1.4GB of which

is left available to the user. There's an SD card slot, though, which can expand the storage capacity up to 16GB, and you'll find a mini-USB port to connect it to a PC for updates and transferring any content. Oddly, rather than using the tried and trusted method of a rechargeable battery, Ectaco has decided that the jetBook Mini will run off four AAA batteries

from a number of languages to set the Mini up with. Incidentally, there are also a few games bundled with the Mini, which include a *Tetris* clone, sudoku and a kind of strange Nokia *Snake*-like game. They're unnecessary really, and do nothing to improve the appeal of the Mini.

The problems of the jetBook Mini are plentiful, but first and foremost is the horrible screen. It

Secondly, it's a very awkward device to hold and use. The shape of the Mini isn't one that feels comfortable, although it does only weigh around 160g, and it's quite small. It's almost like it's trying to mimic a Game & Watch device from a few decades ago. In short, it just doesn't work.

We weren't overly impressed with the Ectaco jetBook Mini. It's an awkward shape, with a poor display, and generally it's more hassle than it's worth. At £130, you could easily buy the Amazon Kindle and have a far superior e-reader with change for a few novels as well.

**“ You find yourself
reading the same line
several times ”**

instead. According to the blurb, this should give you up to 90 hours of reading, but in reality it's more like 12.

Whereas the previous jetBook models had their roots firmly in the educational sector, bundling SAT practise tests and so on, the jetBook Mini is purely an e-reader, but you can choose

never really looks right, in that if you hold it one way the text is too wide apart in a landscape mode and the other way makes it seem too squashed together. Also it's not totally clear either, and you find yourself reading the same line several times and getting some nasty eye tiredness as well.



▲ The Ectaco jetBook Mini is available in a range of colours

E-readers

Kobo Aura H20

DETAILS

- Price: £139
- Manufacturer: Kobo
- Website: goo.gl/r4CLdn
- Requirements: Kobo account

The Kobo Aura H20 is the successor to the hugely popular Kobo Aura HD that was released a few years ago. Since then, Kobo has made some slight changes to its line of e-readers, but the Aura still remains at the top of the range.

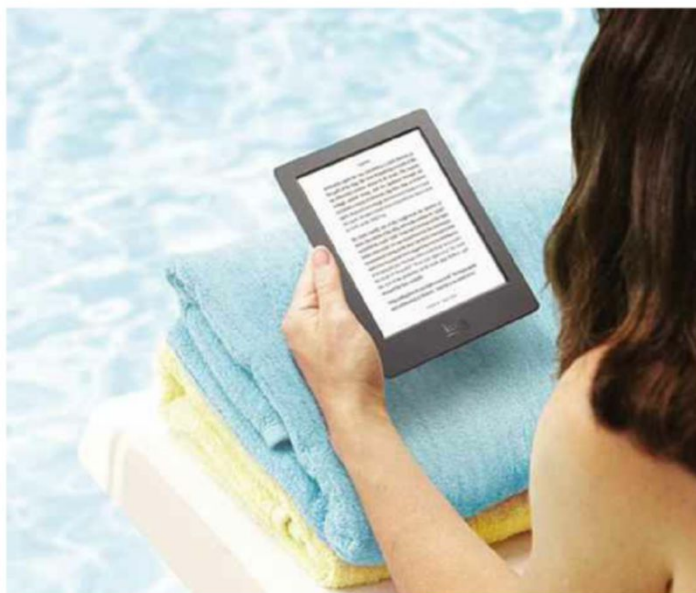
This is a 6.8" screen with a Carta e-ink HD touchscreen and a maximum resolution of 1440 x 1080, which puts it well into the realms of the tablet world but also makes it one of the highest-quality screens out of all the e-readers on test.

It measures 179 x 129 x 9.7 mm and weighs a decent 233g. There's wi-fi 802.11b/g/n, but Kobo has gone one better again by including 4GB of storage built-in, with the potential to increase that to a further 32GB via the micro-SD card slot.

The greatest selling point of the Aura H20 is obviously the screen, and thanks to the ClarityScreen+ technology and a 265dpi pixel density, Kobo has created an e-reader that happily takes the pleasure of reading into new territory. Admittedly, you could argue that you can read a book quite as easily with a 800 x 600 screen as you could a 1140 x 1080 one, and in most cases you'd be correct. However, the detail and sharpness that the Aura H20 offers is exceptional.



▲ The Kobo Aura H20 is a splendid e-reader



▲ A true take-anywhere kind of device

The old Aura HD took an age to boot, and it felt very sluggish when you had to navigate the menu system. Thankfully, Kobo seems to have alleviated this problem, because the Aura H20 is now perfectly nippy and as fast as you expect any e-reader to be.

The welcome or home screen, contains all the necessary information you would expect. Your current library, the Kobo store, a search function, what book you're reading and the last time you synced with your computer are all

present in a reasonably uncluttered fashion.

Battery life is rated at an impressive two months, provided you switch the unnecessary stuff off, and once set up, you can view the usual list of ePub, PDF, TXT, HTML, CBR and so on, as well as the more popular photo formats.

It's a nice device to hold; it feels sturdy enough and not too cheap. The backlight is effective, and the screen is readable in pitch black and full-on sunlight without any problems.

Additionally, and a feature we rather liked, the Aura H20 can be submersed in one metre of water for up to half an hour and still be functional, provided the ports are closed off with the cover – handy for when you drop it while reading in the bathtub or if you're at the beach perhaps.

Reading is a pleasure with the Kobo Aura H20. It's a sleek, comfortable device that's well designed and fits nicely in the hand. There's plenty to like about it, but at £140, you might well be better off with the cheaper Amazon Kindle. However, as we said, the Kobo Aura H20 is a pleasure to use and read from.



Kobo Mini

DETAILS

- Price: £49
- Manufacturer: Kobo
- Website: goo.gl/Y55HqZ
- Requirements: Kobo account

The second Kobo e-reader of the group, the Kobo Mini, isn't actually being produced any more, but it's being sold online and through a number of high-street shops and online, which is why we've included it here.

It's certainly a small e-reader. Weighing 134g, it has 5" touchscreen and measures 102 x 10 x 133 mm. The 800 x 600 e-ink screen has 16-grey levels, and the Kobo Mini contains roughly the same features that the previous e-readers in this group have: 802.11b/g/n wi-fi, 2GB of storage, and the ability to read ePub, PDF, TXT, HTML and so on. Sadly, though, it lacks a backlight, but you can alter the contrast, and you can further improve the reading of the screen by tweaking the sharpness of the font.

It's also one of the oldest models we have in the group, and as a result, the Kobo Mini is somewhat slower than the other e-readers this week, but not enough that it will affect your reading pleasure. The user interface is simple enough, and navigating the home page is responsive and allows you to get to the act of actually reading before sheer annoyance starts to set in.

The Kobo Store offers a fair selection of e-books, with millions available, and it makes your purchase a simple enough affair. There's also not as much advertising as in Amazon's



▲ The Kobo Mini is a good e-reader



▲ The problem is its future is a little uncertain

“The user interface is simple, and navigating the home page is responsive”

case, but you could also argue that less advertising means you could miss something that would be right up your street.

Being pocket-sized has its advantages. It's ideal for a spot of reading on a commute, and it's light enough to be

held by a child, for example. The design of the Kobo Mini is basic, coming in only black or white and feeling more like a cheap import rather than a bona-fide product, although you can improve the look and feel through a series of colourful snap-on cases, if you feel the need to brighten up your e-reader. Some users have also 'enhanced' the Mini to make it function as a flight computer for paragliding and other such activities.

The Kobo Mini is okay, although it's certainly starting to look its age. But considering you can pick one up from Amazon for around £49, it might be enough to make for a cheap, first time e-reader. On the other hand, for another £60 you'll get the far more capable and modern Kindle.

Ideally, Kobo or whoever, is planning on keeping the product going and updating it in the near future. Then again, Kobo could very well wash its hands of the Mini and focus on the newer line of Touch 2.0 readers. In short, you'll need to seriously look into the Mini and consider its future before committing to a purchase.



e-readers

Nook GlowLight Plus

DETAILS

- Price: £49 - £89
- Manufacturer: Nook/Barnes & Noble
- Website: goo.gl/TgtRxI
- Requirements: Barnes & Noble cloud account

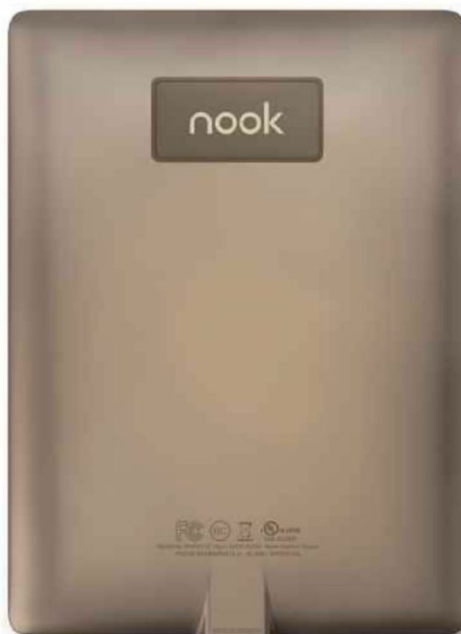
The Nook didn't have a very good start here in the UK. Created by the American bookstore Barnes & Noble, it has gone through a number of changes and is classed as the entry-level device next to the Samsung Galaxy Tab Nook models that Barnes & Noble now offers, primarily because B&N took a bit of a hammering in the market over the Nook and now sells Samsung tablets with a Nook interface.

It's has a 6" e-ink touchscreen, it weighs 195 grams and measures a mere 163 x 119 x 8.6 mm, which instantly makes it a direct competitor to the Kindle Paperwhite, and the screen has a reasonable 800 x 600 resolution, with 16 level greyscale.

The customisable glowing part of the GlowLight allows you to read in the gloom of dusk, right through to absolute pitch blackness. It does the job well enough, and thanks to the anti-glare screen, you can also read in sunlight without any annoying smudges or fingerprints spoiling your view. It has to be said, though, that it isn't as good in direct and very bright sunlight – not as good as the Kindle Paperwhite at least.

The Nook is wi-fi enabled, allowing you to share quotes, access Google, Facebook

▲ *The Nook Glowlight Plus is the last of a dying breed of Nook devices*



▲ *In all honesty, it's not worth the hassle of getting one*

and, of course, the Barnes & Noble online book store, which occasionally recommends titles based on your previous purchases and reading material. It's advertising, true, but it

doesn't feel quite as all-consuming as Amazon's advertising strategies.

You also have 4GB of built-in storage available, or just over 2.5GB after the Nook has finished taking up

the rest. It's enough for a thousand or so books and the micro-SD card slot will allow you to stick another 32GB in to expand your e-library to the tune of a potential 30-something thousand titles – enough for even the most enthusiastic of bibliophiles.

The Nook GlowLight Plus isn't the easiest e-reader to get hold of either. Stocks seem extremely limited in the UK, and you'll more likely find one on the virtual shelves of eBay rather than in a traditional shop. However, some shops do sell them – Blackwell's being one – and you'll be looking at a price in the region of £49 to £89. This is really a little too expensive for a product that the parent company doesn't really want anything to do with anymore.

In short, you're better off spending a little more and opting instead for either the Amazon Kindle or the Kobo H20. While the cheaper price may sound alluring, it's sadly probably not worth the hassle of locating one and buying it.



Bookeen Cybook Ocean

DETAILS

- Price: £125
- Manufacturer: Bookeen
- Website: goo.gl/hdckbC
- Requirements: Bookeen account, Adobe account

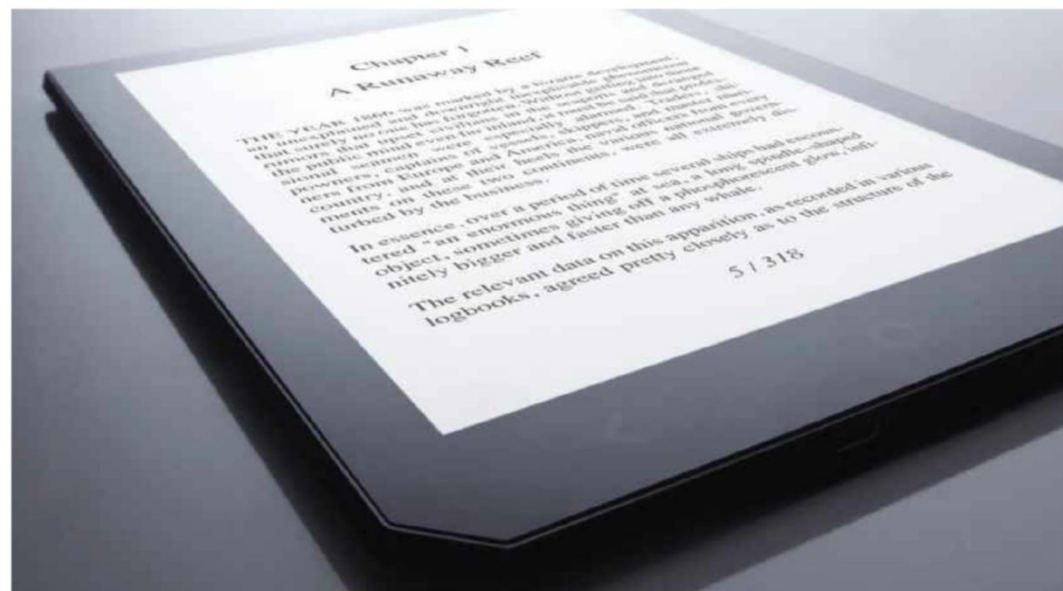
If you haven't heard of the Bookeen Cybook Ocean before, then you're not alone, because we certainly hadn't either. However, it's quite a popular e-reader in its native France, and it does offer something a little different from the other e-readers we have on test.

The Cybook Ocean is a monster of an e-reader, the huge 8" e-ink screen dominating the device and making it feel more like a tablet than most e-readers. But the 1024 x 758 display with its pixel density of 160dpi and 16-level greyscale isn't too shabby.

It measures 196 x 150 x 7mm, which is a surprisingly thin device to hold in your hand, and it's relatively light, weighing a modest 300g. While that's still heavier than the Kindle and Kobo H20, for example, it's not as heavy as a similar sized tablet.

In terms of performance, the Cybook Ocean performs pretty poorly. We suspect that although it has a good enough Cortex A8 800MHz processor inside, there's something added to the operating system that makes it drag its heels when navigating through the various menus, starting up and so on. It's worth noting, though, that reading is fine.

While it's thin, holding it does feel very awkward over



▲ The Bookeen Cybook Ocean is a huge 8" e-reader

longer periods. If, like us, you tend to read before going to sleep, holding the Cybook Ocean while lying down with a pinch-grip with a couple of fingers can get tiring very quickly.

As for the battery, Bookeen says it should for a month,

reverts back to French for the account details. Incidentally, it also reverts back to French for a couple of other menu choices too.

Obviously, you can use your own ePub, PDF and FB2 formats, among a few others, so although the setup may

it's not something everyone wants to do, and there's no sign of the Ocean ever being made available on the high street or virtual shelves in the UK.

To conclude, then, although it's an okay e-reader, the Bookeen Cybook Ocean just isn't as good as some of the other e-readers this week. The Kindle, Kobo H20 and even the Nook are far better reading devices.

“ To purchase a book, you’re taken through an account setup that’s in French ”

based on half an hour of reading every day. We didn't have it that long, but in the short time we have, its still only used about 5% of the battery charge.

Sadly, actually reading something is a bit of a chore. To purchase a book, you're taken through an account setup that's in French – understandably since it is a French product. Even though the user interface can be set to English, it somehow

well be in another language, you can get reading if you have the content already to hand.

The other aspect that will most likely cause a problem is that the Cybook Ocean is currently only available through the Bookeen site, where you'll need to convert from euros to pounds, which in this case comes to around £125, at the time of writing.

Although buying directly from the manufacturer is fine,





Kobo Aura H20

The Kobo Aura H20 is an excellent e-reader that combines everything you'd expect in such a device, as well as a superb screen and design.

If you're looking for an e-reader for the new year, then this is one you should seriously consider.



Amazon Kindle Paperwhite

Regardless of whether you like Amazon or not, you have to admit the Kindle is by far one of the best e-readers currently available.

The price is excellent, and its overall design is too. Well worth buying for the bibliophile in the family.

How We Tested

Each e-reader was tested with a variety of books, both purchased from their online stores or transferred via a PC where possible. Connections to wi-fi were tested, and any other built-in features, aside from reading, were also used.

| | Amazon Kindle Paperwhite | Ectaco jetBook Mini | Kobo Aura H20 | Kobo Mini | Nook GlowLight Plus | Bookeen Cybook Ocean |
|---------------------|--------------------------------------|---------------------|-------------------------------|------------------|-------------------------------|-------------------------------|
| Price | £109 | £129 | £139 | £49 | £49 - £89 | £125 |
| Dimensions | 169 x 117 x 9.1mm | 116 x 126 x 20mm | 179 x 129 x 9.7mm | 102 x 10 x 133mm | 163 x 119 x 8.6mm | 196 x 150 x 7mm |
| Weight | 205 grams | 160 grams | 233 grams | 134 grams | 195 grams | 300 grams |
| Resolution | 1024 x 768 | 640 x 540 | 1440 x 1080 | 800 x 600 | 800 x 600 | 1024 x 758 |
| Storage | 4GB – Amazon Cloud Storage available | 2GB | 4GB – up to 32GB via micro-SD | 2GB | 4GB – up to 32GB via micro-SD | 4GB – up to 32GB via micro-SD |
| Backlight | Yes | No | Yes | No | Yes | Yes |
| Online Store | Amazon | None | Kobo Store | Kobo Store | Barnes & Noble | Bookeen, Adobe |

Top 5

Failed New Year's Resolutions

We promised ourselves we'd be more optimistic, but it wasn't to be...

1 Backing Up

If you're anything like us, you've probably told yourself that since the new year is around the corner, it's time to take backing up seriously. Maybe you're thinking of setting up some kind of automated system, with all kinds of wonderful RAID goodness. But now 1st January has ticked by, and you're no closer to actually doing anything this than you were when you resolved to do it in the first place. It's more of a February job anyway, right?

2 Less Gaming

One of the problems with any type of computer, whether a PC, a smartphone or a tablet, is that they're really good at entertaining you. Games can be huge, complicated affairs, or they can be as simple as pushing a few gems around to make them line up. More than anything, though, they can be hugely addictive, and it's fair to say that playing less of them is a good idea for many people. But can you stick to a new year's resolution to stay away from games? Sorry for the pessimism, but we doubt it.

3 Not Eating At Your PC

This is as much to do with your health as anything, because sitting around all day eating obviously isn't good for you. But it can also be detrimental to the well-being of your PC. Crumbs can easily clog up your keyboard, and drinks can damage components and peripherals - often destroying them permanently. The problem is, when you're engrossed in a Wikipedia page or a particularly difficult game, then the temptation to reach out for those biscuits on your desk is just too much.

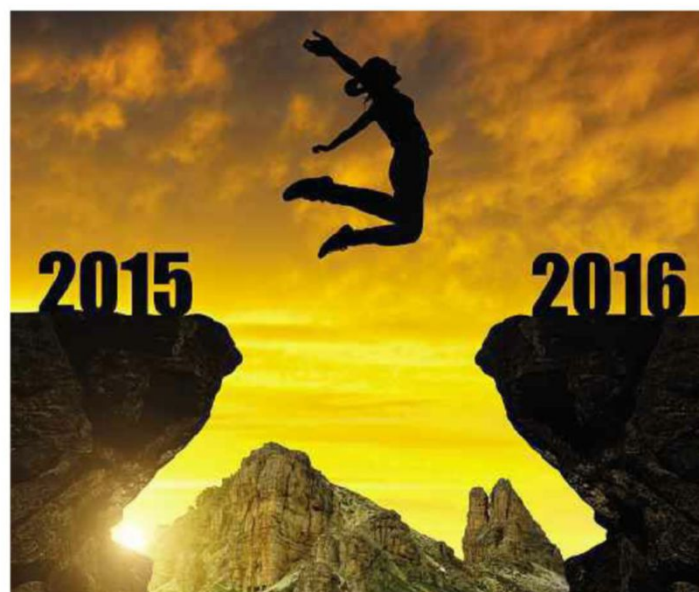
4 Reinstalling Windows

After a whole year's use, even the fastest of computers can end up feeling sluggish, so the start of a new year feels like the perfect time to just clear everything out and start again (backing up your important

files, of course). But it's just so much work! That's why you end up putting it off till later or even not doing it all. That's fair enough: after all, you can always have it as a new year's resolution next year instead.

5 Less PC Time

Whether you're gaming, surfing the web or actually doing something productive with your computer time, looking at a screen for too long is not a good idea, and neither is sitting in one spot for ages. What you need to do is actually get up and go outside. It's a scary thought, because there very few places to charge up your phone outside, but it's something we should all do more of. Get outside, talk to real people, get some fresh air, and remember there was a time before computers. It was probably really boring, but people survived, and so can you.



▲ This year, we'll be trying to spend less time jumping across gorges

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Lesser Known Web Browsers You Should Check Out

We all know about browsers such as IE, Firefox, and Chrome, but there are many more, and some are well worth a look



The internet browser is an essential application. Everyone with a PC needs one if they plan to go online, and a minuscule amount of PC users go without one. Therefore, the humble browser is probably one of, if not the most used PC program of all, aside from the OS itself. It started to become the dominant app it is today when Microsoft began bundling in its own browser, Internet Explorer with Windows, and since then the PC using public have never looked back. IE's inclusion with Windows caused a bit of controversy, with accusations of monopolies and even some other browser companies going under, such as Netscape, but this all led us to the current influx in browsers, although you'd be forgiven for missing this explosion of programs.

It's safe to say that most PC users are familiar with the big three browsers, possibly to the point that they're unaware of any alternatives. Internet Explorer, Mozilla Firefox and Google Chrome are well-established and popular browsers, found on the majority of PCs around the world, but there are other browsers that remain largely unknown, with some that actually offer unique and very useful features.

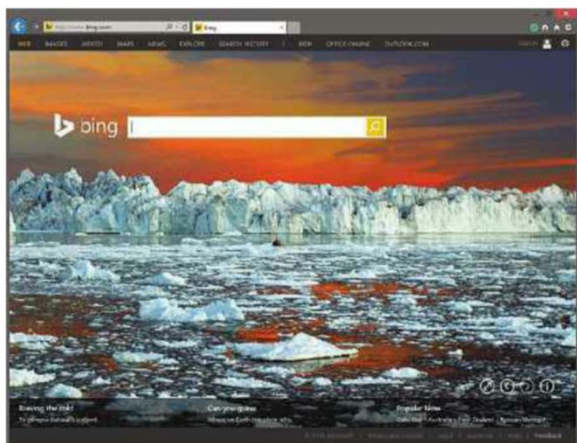
These browsers are many and varied, with some truly unique options, while others have features even the big names don't have. They're interesting and very useful, so you really should be familiar with them, just in case you ever want to try out something new or if a feature you really need but currently lack with your existing browser is within easy grasp, but you simply don't know it yet.

Let's have a look at some of these alternatives, beginning with a couple of options that while not as popular, are still a little more familiar to some.

Opera

Just slipping out of the running in terms of being one of the big browsers, Opera is still one of the best all-round browsers, and it's also one that's helped shape some features of other programs, including the big three.

Opera is known for being a reliable and very stable browser, as well as being very flexible in terms of platform. It can be downloaded for almost all formats, including Windows, Mac, Linux, Android, Windows Phone and iOS. It's also one of the first browsers to make use of the

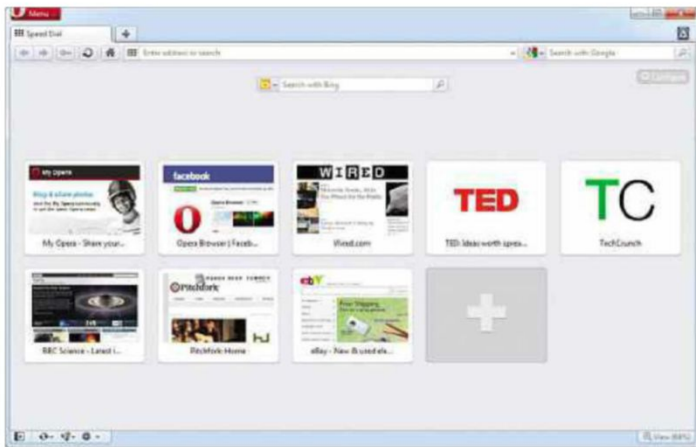


▲ **Internet Explorer**



▲ **Google Chrome**

LESSER KNOWN BROWSERS



▲ Opera

now standard launch page feature, which lists some of your favourite or most visited sites in a list of thumbnails for easy access.

Opera supports one of the newer features in browsing, the ability to synchronise favourites between devices, and it's also pretty fast, with a special turbo mode designed to speed up browsing on slower machines. As it's always popular, you can also customise the app with a range of add-ons and extensions.

Safari

Unsurprisingly, Apple's browser isn't quite as popular on PC, a fact that Microsoft probably isn't all that broken up about. Still, despite coming from the competition, Safari is a solid, workable browser that benefits from Apple's award-winning design.

The whole browser has been created to focus on your browsing, hiding the GUI from sight. The border of the browser window is a mere single pixel wide, and other elements, such as the menu bar and scroll bars are hidden when not in use. There's also a wider window view you can utilise.

Safari is quite fast, and the streamlined user interface makes it a good, no-nonsense option for those who don't really care about all sorts of additional features and simply want to browse the internet. It still has some useful extras, though, such as a powerful search feature for history and bookmarks, as well as built-in pop-up blocking, auto-fill, RSS news feeds and an easy-to-use private browsing tool.

SeaMonkey

If you're after a browser that does much more than simply trawl the internet and you need a tool that can handle more tasks, SeaMonkey may be for you. This browser is based on the Mozilla browser source code and is seen as a direct descendent of the pre-Firefox app.

It has been designed to be a total desktop solution for day-to-day users and to be the only program you'll need to open in a standard PC session. To this end, alongside the browser it also includes integrated email, chat, RSS, HTML editing and more.



▲ Safari



▲ Seamonkey

Of all the tools included, the HTML editor is one of the best and is a surprisingly competent tool for web developers, including newcomers to the field. It's easy to use and has a very visual interface.

The actual browsing capabilities of SeaMonkey are good too, although nothing amazing. Taken as a whole package, however, it's a very impressive program.

Lynx

This is certainly one of the most unique web browsers you'll find online. Lynx isn't a typical browser, and it eschews any and all visual elements in favour of a full, text-based approach. There's no fancy GUI, image rendering or animations, just plain text and old, DOS-style inputs.

You may wonder why you'd want such a lo-fi browser when you can have much more attractive browsers, ones that can show images, play videos and more. The simple answer is speed and legacy use. Lynx will run on very old machines, ones that may not normally be able to even browse the internet, and it's also fast, as it doesn't need to load extraneous elements such as images. This makes it a perfect browser for users who simply wish to read news and who don't care about the visual aspect.

Web developers have also found it to be an invaluable tool, especially for learning design and analysing the structure of web pages. Lynx renders sites more in the way a computer views them, so developers can use this to aid in site design or to learn how basic sites hang together. The lack of any extra content also makes it a very useful tool for troubleshooting new pages, as images and other content don't get in the way, making it easy to see errors and mistakes.

K-Meleon

This browser is another zippy option that's fast and reliable. It's also a very customisable option and uses the Geko rendering engine. The open-source app boasts a few advanced options, such as a built-in pop-up blocker, context menu, a pop-up search bar, specialised keyboard shortcuts and mouse gestures.

The whole interface uses the standard Windows toolkit, so although the program doesn't look all that different from a standard Explorer window, it's light on system resources, as no extra items are needed to load up the GUI. K-Meleon can also be installed onto a USB stick, thanks to a portable version, making it a great browser for mobile users.

Vivaldi

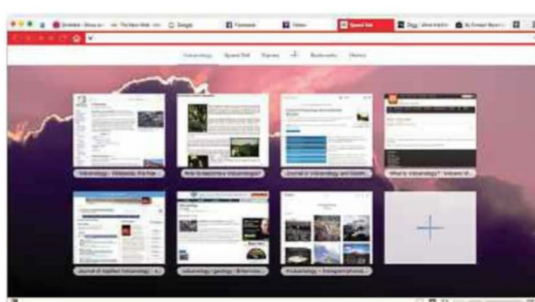
Named after the Italian composer, this browser is one of the newest and is heavily focused on users of Opera who found their old browser becoming something different. It's the idea of former Opera CEO Jon Stephenson, and it's an in-development browser that's taking a lot of input and feedback from users, who are helping to shape the application.



▲ Lynx



▲ K-Meleon



▲ Vivaldi



▲ Pale Moon

This is a key feature, as many other browsers are stuck in their ways and old favourites have alienated existing users to the point where they jump ship and look for an alternative. Having the chance to have your voice heard is a real benefit and could end up contributing to a browser that functions properly.

The browser uses the Blink engine, also used by Opera and Google Chrome, so it has the potential to be big, and it currently includes a speed dial, tab stacks, quick commands and website notes.

Pale Moon

If you've tired of Firefox's increased bloat or you simply want a fast, efficient browser, you should probably consider Pale Moon.

This browser is essentially a specialised, custom version of Firefox that's had all the extras trimmed out in favour of pure speed and efficiency. Designed for Windows, there are many staple browser features missing, as they've been purposely removed, and what's left is a streamlined browser that's very fast and that uses far less system resources than standard Firefox or other browsers you may use.

It's been created to make the most of modern systems, and it supports HTML5, CSS and SVG graphics. In tests it consistently runs faster than competing browsers, and it taxes systems far less, so it's also good for laptops, which can use all the power they can get when on the move.

Maxthon Cloud Browser

Given the ever increasing popularity of cloud services, Maxthon is one of the most promising alternative browsers around and is a perfect option for people who use the internet often on a range of devices.

Maxthon is a browser designed from the ground up to make use of the cloud, and it's geared towards sharing and synchronising data between devices, regardless of type. The browser can share data, bookmarks and even downloads between devices, such as PCs, laptops, mobile phones and so on, and it uses a cloud service to store your files.

This use of the cloud means that the actual performance of the browser is enhanced too, as it uses the cloud to speed up web browsing. Working with files is easy, as files stored on the cloud can be accessed by other devices synchronised to the same account, so music

can be shared across your devices, or you can save videos on your phone to then watch seamlessly on your PC later on. These files can also be shared with others, making for a very useful browser overall.

NetSurf

The main thrust of NetSurf's appeal comes from its low resource usage. It's one of the smallest browsers in terms of power and resource use, and it's also one of the fastest we've seen in terms of browsing speed.

Although this is a streamlined browser that's geared for high speed, it's not featureless. It has a range of tools and options, including URL auto-complete, a global and local history, cookie manager, view scaling and thumbnails. It also supports a rather strange selection of operating systems alongside Windows, such as Linux, BeOS, Atari, AmigaOS and RISC OS. Interesting.

Flock

We wanted to include this browser thanks to its unique social networking features. Sadly, though, it's been discontinued, with no official download links, support or development. That said, you can still grab the browser from many online software websites, and if you use the likes of Facebook constantly, you may want to check it out, regardless of its development status.

Flock is built on Firefox 3 and features a special 'People Sidebar' that's used to keep tabs on your Facebook and Twitter presence. The bar notifies you of any updates, so you can always stay on top of your online socialising, even when you're doing other things on the web. You can even use a special update page that can be customised to keep you up to date on sites like YouTube, and the browser also supports Firefox add-ons, giving you even more customisability.

That lack of any new updates is a shame, but in a world where browsers update seemingly every ten minutes, some may find this refreshing, as long as no security holes or problems arise from this lack of support.

Lunaspice ORION

This is a very interesting browser for web developers or those wishing to get started in this area. Experienced developers will be well



▲ Maxthon Cloud Browser



▲ Netsurf



▲ Flock



▲ Lunascape ORION



▲ Dillo



▲ Camino

aware of the problems that arise when you try your site on different browsers. As browsers use different rendering engines, a site that looks perfect in one browser may look broken on another. Often this is caused by small differences in the way different rendering engines handle code, and it can be hard to detect and fix.

Lunascape can help greatly with this, as its stand out feature is the ability to instantly switch to a different rendering engine. It supports Trident (IE), Gecko (Firefox) and Webkit (Safari), meaning you can test your code out on three browser engines quickly. You can even run them in cascade mode, viewing the site previews side-by-side. Sadly, it doesn't yet support Blink, so later versions of Chrome and other browsers using this engine have to be tested separately. Despite this, it's a superb feature for web developers and makes it much easier to view content and search for any glitches.

The browser itself is also very capable and has many of the features we've come to expect, and it functions very well when compared to the other big names in the browser world.

Dillo

Dillo isn't going to be a browser for everyone, for two main reasons. First, like the previously mentioned Lynx, it's a bare bones browser with a very minimalist design. It eliminates advanced features in favour of super simple browsing and uses a very minimal GUI.

Second, it doesn't support Windows. Instead, this browser is heavily geared towards Linux, as well as BSD and OS X. So if you're a Windows user, you'll find no love here.

As a browser, Dillo is probably the second fastest, just falling behind Lynx, as this isn't a text-only browser. It was developed using FLTK (Fast, Light ToolKit) as a browser for users with low-powered machines and limited space (it was originally created in 1999). It only supports HTML and XHTML with CSS, so it's far more limited than other, larger options, but the speed boost you get means it could be a good choice if you want to get to your daily news sites quickly.

Camino

This is an option for our Mac-owning readers and is an OS X supporting browser that's an open-source alternative to Safari and even a potential replacement for Firefox. It's built using Gecko and has support for various operating system services, including Bonjour, Keychain and Growl.

Thanks to this inclusion of some system elements, it makes the browser more useful, and it also offers the full range of usual, everyday features found in the likes of Firefox and Safari. It's a very good browser and one that Mac users may want to check out if they fancy something different.

Arora

This is a powerful application that features the full range of options found in most other browsers and is perfectly suited to the everyday

internet user who needs a solid and dependable application. It's built on the Webkit engine, and it functions very much like Google Chrome (although it doesn't use Chrome's later engine, Blink, which is a fork of Webkit). Because of this, it's a good alternative for existing Chrome users looking to migrate from their old OS.

It features useful tools, such as private browsing, ad-blocking and session management, and it has a very clean and easy-to-use GUI that's not bogged down with too many extraneous extras.

Are Two Better Than One?

That covers our selection of alternative browsers, and there are plenty more out there you may wish to try. Whichever you go for, hopefully this will open you up to more than the major name browsers and show you that there are more options out there for you to sample. Should you stick with one browser, though?

It's a reasonable question. We only use one anti-virus app or firewall at a time to avoid conflicts, so you may assume the same is said for browsers. This is not the case, however, and you can use several browsers at once if you wish to. In fact, most users will have at least two if they choose another program other than Internet Explorer, and these work well enough together.

Browsers are not really system-level programs and don't need the same deep access to your files as security tools, so there's rarely any reason why such programs should conflict. The only problem you'll have is choosing which one should be the default. So if you're thinking of picking a new favourite browser, don't be afraid to experiment. [mm](#)



▲ Arora

Ubuntu Touch – Android Rival?

What is the Ubuntu Phone OS actually like? Chris Salter gives it a test

There are currently three big phone operating systems: Android, iOS and Windows. Combined, the three have a huge share of the smartphone market, certainly in the Western world. However, they aren't the only phone operating systems about, and the likes of Firefox OS and Ubuntu Touch have been looking at changing that, if not in the West, then in the emerging markets, where high-end smartphones along the lines of Apple and Android are being challenged by locally produced and cheaper alternatives.

Mozilla has recently pulled the plug on Firefox OS, however, so that just leaves Ubuntu to fight against the big boys.

Canonical, the software firm behind Ubuntu, decided to enter the smartphone market, the aim being to converge its Linux desktop offering with a mobile operating system. An ambitious plan, seeing as Microsoft had tried it with Windows 8, and Apple was adding more features to iOS to bring it in line with OS X.

Ubuntu Touch took some time to get going, though. It was announced in October 2011 that Ubuntu would support smartphones in the future, but it wasn't until January 2013 that we got a glimpse of the first Ubuntu Touch release, and it wasn't until later in that year that version 1.0 was released. This initial release would work on the Google Nexus devices and required the user to flash the device with the Ubuntu Touch image.

In the meantime, Ubuntu had created the software store within the desktop, hoping to move that across to the phones as and when the operating system took off.

In February of this year, Ubuntu Touch had its first smartphone released: the BQ Aquaris E4.5. If you've never heard of BQ, it's a small Spanish smartphone manufacturer that happens to make Android smartphones, as well as Ubuntu smartphones. While the initial release consisted of just a single phone, BQ has since added a 5" version of the phone with some updated specifications. In addition, another Ubuntu Touch phone has been released by Meizu (the Meizu MX4 Ubuntu Edition). Both these manufacturers are fairly small, but

they also offer the same phone with Android on. Perhaps until one of the large manufacturers takes up the OS, it's unlikely to become a mainstream phone OS, although as a chicken and egg problem, one of the large manufacturers such as HTC is unlikely to pick it up until there's sufficient demand.

However, how does it compare to Android and other systems? Is it any good? I purchased a BQ to give Ubuntu Touch a test.

Ubuntu Touch

The BQ Aquaris is a fairly unassuming phone. Specification-wise, it's not a high-end phone by any stretch. I'm not a huge follower of phone specifications, but the phone is towards the lower end of the market (see the specification boxout). The phone cost €170 (approximately £125) when I bought it, putting it towards a mid-range market price. For comparison, you could purchase a Moto E, which had a similar specification (1.2GHz quad-core Snapdragon, 1GB RAM and 8GB internal space with a 5MP rear camera but with support for 4G) for about £100.

The phone is sold SIM free and takes a micro SIM, so I was able to use the same SIM I'd been using in my Samsung S5. The Ubuntu phone doesn't support 4G, so I was limited to 3G, but this was a factor of the phone, rather than the operating system. The phone is fairly unassuming and lacks buttons. In fact, that's one thing that took some getting used to: the phone has no buttons, other than the power and volume buttons. No home button here like the iPhone. It's also a dual SIM phone, so you'll be able to use two different SIM cards at once. I hear this is more common in foreign countries, where users often have two SIM cards: one for the expensive data plan and one for the talk and text package. However, it might benefit someone looking to cut down from having a work phone and personal phone to a single phone.

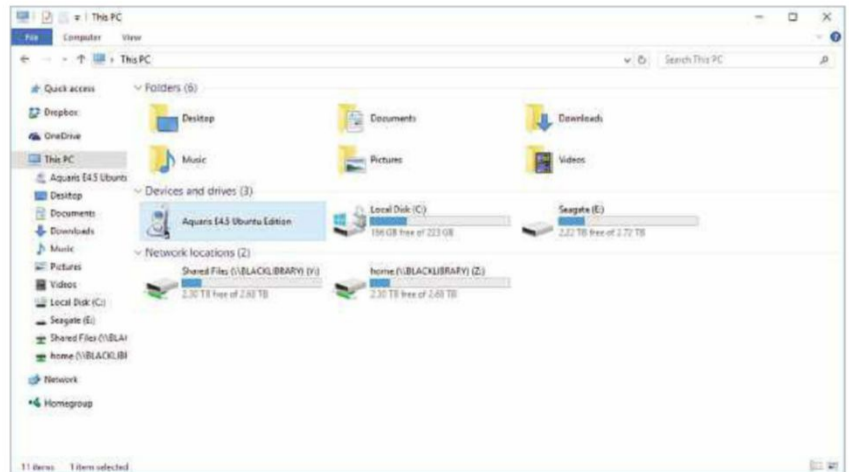
The phone also takes micro-SD cards up to 64GB. While some Android phones are slowly dropping external storage support, the Aquaris still has the slot, and Ubuntu Touch lets



▲ Account list that Ubuntu Touch can access by default



▲ Application changer – swipe right to left to access



▲ The phone and SD card appear as a device, rather than drive

you use it for images (from the camera) and for music storage. There appears to be no default method of checking how much space is free on the device. Even though the phone has an app for managing the micro-SD card (in terms of formatting it; there doesn't seem to be a file browser), the method for checking storage on the phone doesn't also check the micro-SD card. It also doesn't appear that you can offload apps to the micro-SD card. Yet you can download a Terminal app (that then asks for your password; it's your phone lock code if you have one), and you can browse the file-system of the phone and micro-SD card just like you could a Linux device (it is running Linux, after all). This lets you list files and check used space from the command line. It also allows you to access and move files using the default Linux commands (mv, cp etc.).

The setup of the phone was fairly easy. Like any other smartphone, upon switching on, I was asked to choose my language and then proceed with the setup. The initial steps were straightforward, connecting to my wi-fi. And that's it! It does ask if you want to connect any online accounts, but unlike Apple and Android, you aren't required to create an online account to set up the phone. Mind, like Apple, Google and Microsoft, if you want to download apps from the Ubuntu Store, you'll need to create an account. This is an Ubuntu One account, which is a single sign on, so you can use it

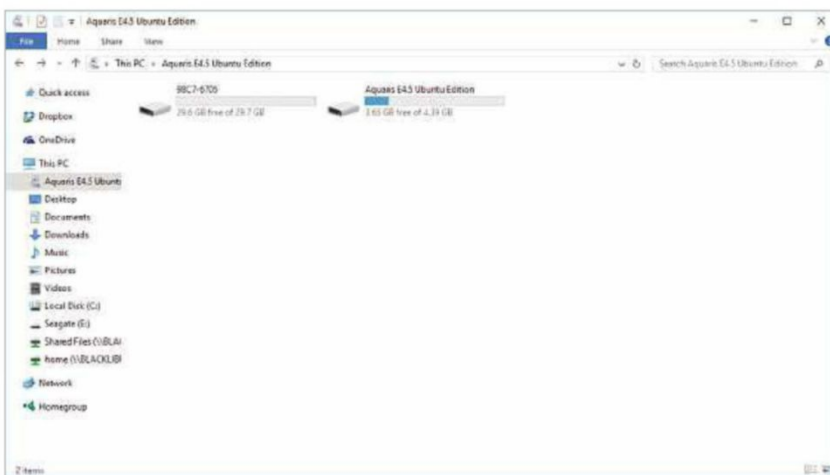
on Launchpad and other Ubuntu services (you might not, therefore, have to create an account if you already have one).

The Ubuntu system, like the desktop, allows you to connect to various other different online services. I was able to connect my phone to my Google account, allowing me to sync all my

“ Navigating the phone is all done with gestures and swiping from the sides of the phone ”

contacts between my iPhone and Android devices. There are a list of services that can be linked. These include Google, Evernote, Twitter and Flickr. These let you interact with the services via apps and scopes (see boxout for what a scope is).

Using the phone is perhaps different to all of the major brands. There are no back buttons, home buttons or any such navigation controls on the home screen or in general. Anywhere else, though, certain apps do have navigation buttons. Navigating the phone is all done with gestures and swiping from



▲ Browsing the Ubuntu Phone in Windows Explorer



▲ The main scope screen – a summary of the day



▲ The main app page, showing the installed web apps and apps



▲ The Ubuntu Store front



▲ The gallery app lets you view your photos



▲ Ubuntu Touch allows you to link different accounts with popular web apps



▲ The boxed phone

the sides of the phone. This certainly takes some getting used to, as it goes against everything that's been done to date in the phone market. On the iPhone, you use the home button to return to the main menu and use the buttons in app. Android depends on the hardware but usually has a back button (even a software one). Ubuntu does away with all of that and everything is done by swiping in from the sides of the phone.

Swiping right to left brings up the app menu; users of the desktop version of Ubuntu would be at home with this, because it's the same as the launch bar on the desktop (Ubuntu is keen to bring the desktop and phone experience closer together). Swiping right to left from the edge of the phone brings up the quick application changer. However, this can be annoying when browsing the scopes on the main page, as I found that I would often pull up the application changer, rather than change the scope I was looking at. I'm sure with more practise, this wouldn't happen, but it made navigating feel a bit clunky, as I was often having to go back to the beginning of what I was doing.

Swiping down from the top brings up the notification centre. This puts most Android ROMs to shame in how much detail you can access from here. There are a lot of changes that you can make from the notification centre in terms of power settings, notifications, Bluetooth and other settings.

However, these are all on different pages of the notification centre, so you can find yourself swiping across on the different pages to find what you're actually after. Swiping up from the bottom (while in the scopes) brings up the scope chooser. From here you can rearrange or change the scopes that are in the main screen. A large range of scopes are included, and you can download more from the app store. Most of these are similar to Metro apps on Windows: news articles and web services you might use often. However, you can have messages, call logs, pictures and music scopes here so you can have quick access to files when you need to.

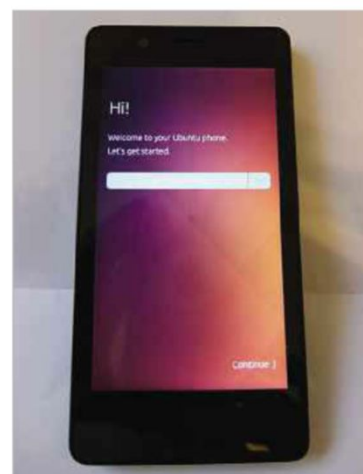
Accessing files on the phone can be done by plugging into the computer. Plugging into a Windows machine makes the phone appear as a device (rather than a removable drive). This is actually a good thing, as you don't have to browse the entire phone file system to access photos or videos if you need to. However, if you use a Linux box, you can hook into the file system directly by downloading the phablet-tools package in Ubuntu (these are in the Ubuntu universe repository). With these installed, you can hook directly into the phone file system and core functions itself. You can also access the phone via command line and perform tasks (for example, you can take screenshots of the phone by issuing a command from the terminal).



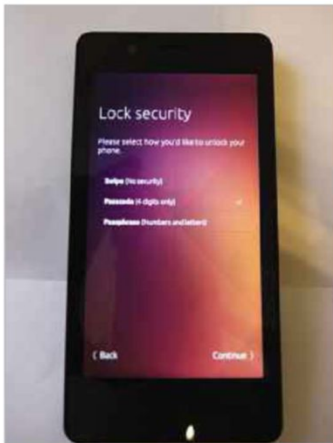
▲ The B4.5 compared to a Samsung S5 and an iPhone 6 Plus



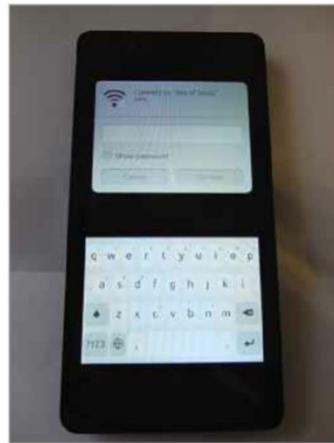
▲ The features of the phone set out on the back



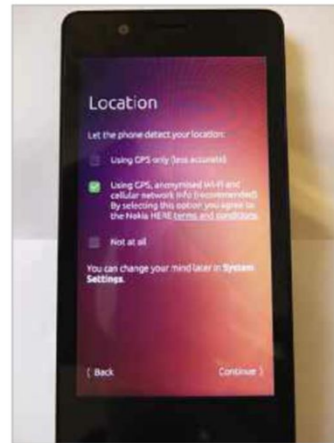
▲ First stage of setup: language selection



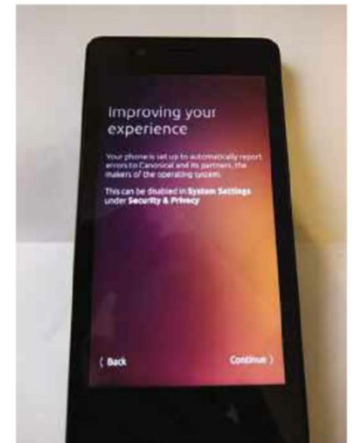
▲ **Second stage: setting up the lock for the phone**



▲ **Third stage: connecting to your wi-fi**



▲ **Fourth stage: location and privacy setup**



▲ **By default, Canonical is informed of your usage**

The core functions of the phone, calling and messaging, were fine. I didn't have any problems there. Yet, as a smartphone, it was interesting to see no email app installed, whereas Android, Windows and iOS all include a raft of default applications, email being one of them. Perhaps because Ubuntu doesn't offer its own email, it doesn't feel the need to include one; only a Gmail app is installed by default.

Conclusions

I've tried here to consider the operating system rather than the specifications of the phone (though they needed mentioning). The phone performs reasonably well, but it might be good to see the performance on a faster handset. This isn't to say that the operating system doesn't work, because it does, but running on a high-end device would be a good test to demonstrate what the operating system is like running on top-end hardware and therefore showing the limitations of the software, rather than any limitations that might be caused by the phone itself.

“It's a bit rough around the edges”

Like Windows Phone, Ubuntu Touch suffers from a lack of apps. It's a bit of a catch-22, as Microsoft has found: people don't want to move to the phone until it has applications, and developers don't want to develop until people are using the platform. However, Ubuntu has the perk of being open source, so others can edit and make changes if they want to. Even though the operating system should be open source, not all the apps are, and there are paid-for apps within the app store already. I've nothing against this myself, as developers have put time and effort into the design and programming of the work, but it could put off some hard-core free and open-source software fans, who might have been attracted to the Linux roots of the phone.

The current market for the phone is hard to figure out. This could be reasonable for someone as a first phone: if you haven't used another smartphone, the difference in navigating wouldn't be so different, though this is easily picked up. The scopes are an interesting feature, akin to widgets, but perhaps more focus should be on native apps, rather than web apps.

Saying that, research shows that the developing market, such as in Asia, uses websites and web apps far more than apps, so perhaps this isn't a problem for users not used to apps.

Overall, Ubuntu wants to bring together the experience of using a desktop and phone. I think that this experience is wide of the mark. I'm not even sure that people want their phones and computers to be the same; after all, smartphone usage is on the rise, but computer use is falling. People would therefore want the phone to be able to do what they want it to, and I think Ubuntu misses the mark slightly in this regard. Without an easy way to share photos to online services or other files, it makes it a bit difficult. With the underlying Linux roots, however, it could make an ideal phone for a Linux geek who loves the command line; they should be able to make the phone their own. As a basic smartphone OS, it works sufficiently well. It could prove interesting to see where it develops, but at the minute, it's a bit rough around the edges. [mm](#)

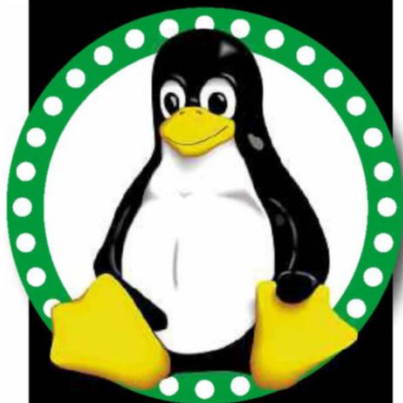
Specifications

The BQ Aquaris consists of the following specs:

- 1.3GHz quad-core Cortex A7 CPU
- Mali 400 GPU (500MHz)
- 1GB RAM
- 8GB internal storage
- 4.5" screen
- 960 x 540 display (240 pixels per inch)
- 8MP rear camera
- 3G supported (but not 4G)

Scopes

Not all the downloads in the app store are for apps; you can also download Scopes. Scopes are pages on the default home screen of the phone that you access by swiping left and right. The default one is a summary screen – think the iPhone notification centre. Scopes can be added or removed as you want and can be rearranged. They're basically heads-up displays. Some, like the built-in Reddit scope, allow you to browse websites from the home screen. Ubuntu calls these home screens for different content.



David Hayward has been using Linux since Red Hat 2.0 in schools, businesses and at home, which either makes him very knowledgeable or a glutton for extreme punishment

Linux

Is SteamOS Worth It?

David looks at how this gaming-focused OS has been received

Now that the Steam Machines are available (I reviewed one a few days ago, and it should be appearing in the magazine soon enough), there's been a bit of a commotion over the bundled operating system.

SteamOS was the grand plan from Valve after Gabe threw a wobbly and decided that Windows 8.1 was evil, and the world will now go to Linux. As a result, Valve spent many months – years even – developing a new Steam client that was actually based on an entire Linux distro.

Since Debian was by far one of the one most improved Linux distros, it was chosen as the backbone for the new SteamOS. And according to many sources, it would revolutionise the world of gaming and bring the PC into the living room as a real contender against the PlayStation and Xbox.

Unfortunately, the release of the Steam Machines and SteamOS hasn't quite hit the mark. Originally, over two years ago, I thought the idea of having a SteamOS was a wonderful thing and something Microsoft just may well be a little fearful of when it arrived. However, the momentum that originally fuelled the SteamOS revolution has, excuse the pun, run out of steam.

Personal Experience

While the Steam Machine I reviewed was splendid in many ways, in terms of the hardware and the overall appearance of it, I felt really let down by how the operating system performed.

SteamOS was slow, buggy, failed to work with the Steam Controller at first – until several reboots later – and had the annoying habit of frequently crashing and freezing when in a game or in the Big Picture desktop.

It wasn't the fault of the Steam Machine either, as I tested it on a couple of other examples. I contacted another reviewer, who had recently gone through their Steam Machine tests, and his evaluation of the operating system was the same. "To be honest," he said, "I wiped SteamOS and installed Mint 17 with the Steam Client separately. I got a better performing machine and with fewer crashes."

Okay, so SteamOS still has some updates to go through yet and there are still problems, such as when a SteamOS PC comes out of suspend, the Steam Controller refuses to work – which incidentally Valve has replied to with: "Given the state of hardware and software support throughout the graphics stack on Linux, we didn't think we could make this reliable." But the point is, is it really worth it now?

Linux Is Linux, Windows Is Windows

I think the main problem with SteamOS is that it's trying too hard to be a Windows gaming beater. Rather than simply enjoying a Linux gaming build on a reasonably powerful PC, Valve has come up with something that was designed to beat Windows and the consoles into submission.

Sadly, Linux can't hope to compete with Windows or a console when it comes to gaming. It may sound like an extremely negative comment against Linux, but it's true. Windows has better graphics driver development and DirectX, and the big game studios working with it. The consoles have dedicated hardware and a better software layer and the big game studios too. Linux doesn't – not to the same level at least.

So perhaps Valve should have stuck with offering a good Linux experience through the traditional Steam Client and some great Linux games?

What do you think?

▼ *Steam Machines are ace. SteamOS? Not so much*



Stop The Rot

The Mac App Store has become a joke. But Apple must realise developers fleeing its walled garden is far from funny

When I was writing this column, the first thing I saw every time the Mac App Store was launched was a bloody great banner for OS X El Capitan – and this was on a Mac that was already running OS X El Capitan. Elsewhere, there were banners for a few games and a picture of a hummingbird, desperately trying to tempt visitors to click through to a selection of photography apps.

Rather conspicuous by its absence was illustration app Sketch – and with good reason. The former Apple Design Award winner, essentially the definitive example of a Mac App Store-era app, had been pulled. But it wasn't Apple that booted the app from the Mac App Store – the developer did the booting. On the company's blog, Sketch's creator outlined the many problems with the Mac App Store, such as technical limitations imposed by Apple, the lack of upgrade pricing, and app review taking far too long, even in the case of critical bug fixes. By going direct, Sketch can become the app its creator want it to be.

"We don't expect this decision to be unanimously popular,"

reasoned the developer, but there was little fury online. Instead, it seems everyone is increasingly resigned to the Mac App Store's future. The rot set in long ago. In some cases, major apps never made it to the store, such as Adobe and Microsoft's big hitters, Autocad, Pro Tools, SuperDuper! and Dropbox. Others – Quicken, Coda, BBEdit – remained for a while, until the developers came to the same conclusion as Sketch's.

The result, increasingly, is a store that looks destined to be full of throwaway apps, games and dodgy iOS ports, rather than a kind of one-stop-shop for the very best software the Mac has to offer.

There are, of course, currently exceptions. Apple's own software exists on the store (although developers note Apple doesn't always hold itself to the same limitations that it forces on others), and other impressive fare remains. Fantastical, 1Password, Pixelmator, Ulysses and Affinity Designer are all superb productivity apps available on the Mac App Store. But if Apple continues down the same road, the risk is even these apps might soon go it alone.

"One of my bug fix updates for El Capitan is still in review after 59 days," said developer Michael Tsai on his blog. This makes no sense. The entire point of the Mac App Store is to make everything easier for everyone. For consumers, it's a place they can rely on to shop for secure, safe, quality software. For the developer, Apple takes care of payment and hosting, along with making installation entirely painless – in return for a 30% cut.

But today's Mac App Store increasingly feels abandoned not just by the BBEdits and Sketches of this world, but also by Apple. Beta testing service TestFlight doesn't work with the Mac App Store – only iOS. And recently, someone at Apple forgot to update a security certificate, resulting in millions of users not being able to launch apps. Even when the problem was fixed, some people using older versions of OS X were left with permanently broken software. So rather than making things better, the Mac App Store is demonstrably making things worse for everyone.

Apple should either put some serious effort into trying to fix things or just shut up shop. The worst of all worlds will be doing nothing, resulting in the slow death of something that should have been great. Developers will continue to flee, finally leaving the App Store charts to abruptly stop when the list of Apple apps runs dry.

< You won't find Sketch on the Mac App Store any more. Increasingly, you won't find any pro software either



Craig Grannell is a writer, designer, occasional musician and permanent loudmouth. He's owned Macs since 1996, when Apple was facing certain doom, and is therefore pleasantly surprised by its current success. Find Craig on Twitter at @craiggrannell



Mac



Ian is a professional IT analyst, a semi-professional writer and a pretty amateur electronic musician. He likes gadgetry and loves making gadgets do things they were never designed to do

Mobile

Mobile Accessories For Christmas 2015

Ian McGurren looks at the best extras for Christmas gifts

It's one thing having a phone or a tablet, but part of the fun is all the accessories you can get for them – some useful, some.... not so much. Here are a few.

Google Chromecast Audio - £30

The Chromecast has been around for a while now and has been quite the success for Google, despite being slightly confusing to describe succinctly to the non-tech savvy ('You throw things at your TV?!'). This year it was refreshed and joined by an audio-specific version, attractively shaped like a tiny record that plugs into your hi-fi or other sound system via a standard 3.5mm jack or optical cable. It's not the first time Google has released a hi-fi friendly device, though if you got a Nexus Q, you were in the minority. The Chromecast audio is a cheap but well-made device that makes a ton of sense if you have an Android phone and want to be able to stream audio to kit you already own, as many of us will do. If it streams to Chromecast already, like iPlayer Radio, Spotify and Tune In, then it'll work, and work in exactly the same way too. For £30, it's great value – unless you have Apple Music....

Amazon Echo - US only officially, eBay and such unofficially

If you want to really impress the tech-head in your life, there's a step up from the Chromecast Audio in Amazon's smart speaker, the Echo. It takes the concept of the Bluetooth speaker and marries it to Amazon's Google Now-alike virtual assistant, Alexa. Echo contains two speakers but just for one channel, but Amazon

claims to be able to fill a room with sound (though to be fair, you can't not fill a room with sound really). On top of the standard Bluetooth audio function, there are voice commands, wi-fi awareness (so you can push music from your Fire tablet to it), access to cloud services (that may or may not have the word Amazon in them), as well as general web searches and such. Echo's cache, though, is that it's US only for now, so any UK gadget freak will be especially excited to own one of very few over here, albeit at around £200 on the auction sites.

Portable Battery Pack - around £20

You'll have to excuse the poor choice of words, but the proliferation of portable battery packs has exploded in the past 12 months or so, partly due to their dropping in price and partly due to smartphone batteries still being pretty poor. Possibly the least glamorous accessory here, they're probably the most useful too, with even a trickle of charge being a boon when the percentage meter reaches the lowest numbers. There are many turning up in the cheaper end of home stores for around £5 but with only around 2800mAh charge (roughly the same as your

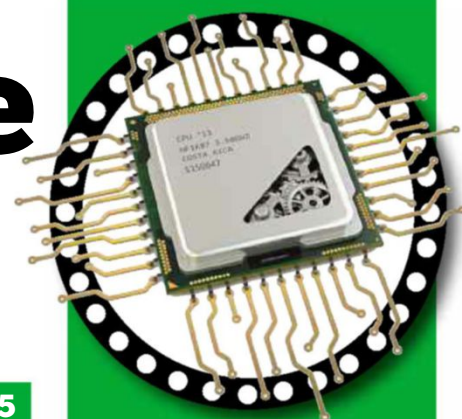
phone), they're mostly useless. If you're going to get one, go big or at least over 10000mAh, and from a reputable manufacturer such as Anker. It's advisable to get them from a reputable dealer, such as Amazon itself too, as a dodgy one could mean a minor scalding at best and a deadly fire at worst.

Google Cardboard - Free to £30

Possibly the cheapest, and definitely the most fun here is the Google Cardboard virtual VR headset. Actually coming out in 2014, the platform – and mobile VR in general – is starting to take off, and such is the design, you can even spend a few pounds more and get one made from something other than cardboard. Mind you, building it yourself is part of the Blue Peter / Great Egg Race charm. Once assembled, and using the Google Cardboard approved apps, you get a clever glimpse into the fun of VR, and while it's very much Ceefax to OculusVR's internet, it gives the wearer a definite sense of immersion, even motion sickness. Worth keeping an eye out for are the (very) limited edition Star Wars versions released in the US, apparently to coincide with some minor film or other...



Best Hardware Of 2015



Andrew Unsworth enthuses about his favourite hardware of 2015

Oh, yes! It's that magical time of year again when tech journalists clasp their hands to the side of their heads and scream "Why?" into their monitor. Another year gone, and another 525,600 minutes of precious time squandered. Another 365 days in which they still haven't written the 21st century's answer to *The Hitchhiker's Guide to the Galaxy*, reinvented the wheel or even washed the bedclothes as much as they should have done.

For me, however, it has been a year of adjustment, a year of fine lunches, fine wine and fine conversation, mostly from other people. A year in which I wanted to buy a new Jag but didn't, didn't want to go job-hunting but did, and a year in which I watched spellbound as Britain's great and good watched Her Majesty the Queen polish off a set of sandwiches in a tent, much as one would watch a polar bear in a zoo polish off a confused seal that had somehow wandered into the wrong enclosure and mistakenly asked for directions. After a depressing start, it has been a cracking year. I sincerely and genuinely hope that your year has been good

too, and that your 2016 will be even better.

As for hardware? It's been a great year for that too, with some exciting revisions of popular products released, as well as some brand-new products that have well and truly blown the legs off all who behold them. Over the next few weeks, I'll be reminiscing about some of them, and you're welcome to come along for the ride.

First up, we simply must talk about Intel, as this was the year the CPU supremo released its new Skylake range of processors and the chipsets that allow the magic to happen. 2014 saw the release of my beloved Haswell-E series of chips, a range that includes my beloved Core i7-5960X, and the X99 chipset. Haswell-E introduced the mortal world to the joy of DDR4 memory, but it's Skylake that has brought DDR4 out of the skeleton chassis and into the regular desktop.

Skylake improves on Haswell's power efficiency but not at the expense of power. After the disappointment that was Broadwell, Skylake has been a breath of fresh air, bringing with it a new socket type, new RAM, a new chipset

and a new excuse to give your system a radical upgrade.

Like Broadwell, the Skylake chips are a 14nm process, but Skylake is packed with newer technology, such as improved on-chip graphics processors that support DirectX 12 and allow better desktop performance and better frame-rates in games than previous-generation chips. There's even support for running Ultra HD resolutions at 60Hz, although I've no idea how successful the chips are in that endeavour.

For those interested in raw power, there's only one choice to be made, and that's choosing between the Core i7-6700K and the Core i5-6600K. As I'm sure you know, the 'K' suffix in these chips' names signifies their overclockability, although you don't have to overclock them to appreciate their potency. However, the low thermal design power (TDP) of the lower-end chips makes them just as attractive, albeit for use in PCs that'll spend most of their time web browsing rather than video editing.

If you need an excuse to blow the rest of your Christmas money, Intel's Skylake chips are available at the usual stockists. More Best Of goodness next week.

Andrew Unsworth has been writing about technology for several years, he's handy with a spanner, and his handshaking skills are second to none

Hardware





Ryan Lambie has loved videogames since he first stared up in awe at a *Galaxian* arcade cabinet in his local chip shop. 28 years on, Ryan writes about gaming for Micro Mart. He's still addicted to chips and still useless at *Galaxian*

The Force (Re) Awakens

A promising game we never thought we'd never get to play. Star Wars 1313 may not be dead after all, according to Lucasfilm's boss, Kathleen Kennedy

This week, Ryan looks at *Star Wars 1313*, the game we long thought had passed into history, and checks out the reaction to EA's *Star Wars Battlefront*...

Plug & Play

With *The Force Awakens*, director JJ Abrams has ushered in a new era of *Star Wars* mania, and the newly revived space fantasy series is now just about everywhere we look. But for fans of the series, there's one game that continues to inspire wistful thoughts of what might have been: LucasArts' *Star Wars 1313*.

First announced in 2012, *Star Wars 1313* was pitched as a gritty action game set in the criminal underbelly of the planet Coruscant. Early footage showed third-person blaster battles aboard a disintegrating space ship descending into the bowels of Coruscant's subterranean city. In terms of technical polish and tone, it looked like thrilling stuff; its designers appeared to have captured the battered, "used future" aesthetic of the 70s and 80s Original Trilogy in a way the *Star Wars* prequels hadn't quite managed to.

Things got even more exciting when designer Dominic Robilliard started talking about the game's more "mature" focus: "...when we talk about making something that's mature-themed," Robilliard told IGN, "it really is about those characters, the type of story content we're going to be dealing with, and the kind of things

they're motivated by. The world itself as well."

Then there was *1313*'s protagonist: a young bounty hunter who would soon be revealed as none other than Boba Fett – arguably the coolest mercenary in the *Star Wars* firmament. The game would have followed Boba as he journeyed through the Coruscant underworld, gradually gathering the high-tech gadgets and gear that ultimately become his trademark.

Sadly, this most promising game was affected by events entirely outside the designers' control. In October 2012, The Walt Disney Company acquired Lucasfilm for a shade over \$4bn, and within six months, LucasArts had become a shell of its former self. Its development arm was closed, its staff laid off, and all projects were put on permanent hold. That closure preceded a further deal which saw all the exclusive videogame rights to *Star Wars* go to EA – thus paving the way for this year's shooter, *Star Wars Battlefront*.

With that, it seemed to be game over for *Star Wars 1313*. But more recently, a glimmer of hope has appeared within Lucasfilm itself; the company's CEO, Kathleen Kennedy,

mentioned the "*1313* game" during an interview with the movie website Slash Film, and the news sounds vaguely positive. Lucasfilm's new owner, she said, has been spending "a lot of time" looking at the material George Lucas left behind, and *Star Wars 1313* could be one of the projects it will choose to revive.

"Our attitude is, we don't want to throw any of that stuff away," Kennedy said. "It's gold. And it's something we're spending a lot of time looking at ... and we may very well develop these things further. We definitely want to."

So there we have it. Nothing definite, but a new hope, at the very least. Although its story and design and even name may change, there's a chance that *Star Wars 1313* may see the light of day after all.

Online

If it does indeed emerge, *Star Wars 1313*'s release is likely to be many years in the future. In the here and now, EA's *Star Wars Battlefront* is the game designed to tap into our inner Jedi (or Sith). From a visual standpoint, most can agree that it's a *Star Wars* fan's dream; the sights and sounds of the movie universe, from the whine of X-Wing jets to the high-pitched



▲ There have been numerous complaints of matchmaking problems in *Star Wars Battlefront*. EA Dice says it's working on a fix

pew-pew of lasers, are all lovingly recaptured.

In terms of the action itself, reviewers have been rather more cautious. With a relatively simplistic shooter lurking beneath the gorgeous graphics, can it really justify its hefty price? EA's chief financial officer Blake Jorgensen has himself admitted that *Battlefront* may be lacking in a bit of much-needed depth.

"We had designed it to be a much more accessible product to a wide age group," Jorgensen said at an investor's conference. "So an eight-year-old could play with his father on the couch, as well as a teenager or 20-year-old could play the game and enjoy it. It is more accessible. And for the hard-core, it may not have the depth that they wanted..."

There's nothing necessarily wrong with an accessible

shooter, of course, but one of the most common complaints levelled at *Battlefront* is its matchmaking. At the time of writing, there have been numerous reports of players hanging around on the game's match finding screen, waiting in vain to be able to join a match. Head to *Battlefront*'s discussion forums, and you'll find dozens of complaints along these lines, with either long waiting times or matches where high-level players were teamed against lower-ranking newcomers who don't stand a chance of winning.

It has to be said, though, that EA Dice's communication has been rather good when it comes to these issues. A developer calling himself Guillaume-Dice responded to the complaints in the same thread, admitting that, "The matchmaking and finding

servers is also a big problem we're doing our best to fix."

"We're hearing the issue you have, and we really want to improve the game with you guys," Guillaume added in another post. Here's hoping *Battlefront*'s matchmaking problems can be resolved in a not-too-distant patch.

In the meantime, EA Dice has confirmed that, with *Battlefront* now launched, it's starting work on another major game in its stable. Tweeting on 11th December, development director Dan Vaderlind wrote, "I am moving on to another project, the next *Battlefield*..."

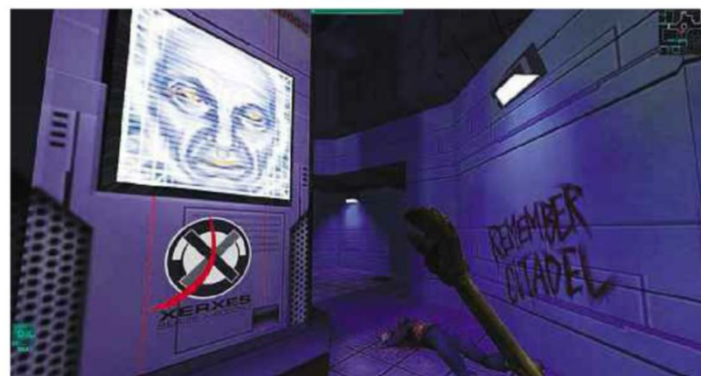
While little's known about *Battlefield 5* as yet, the studio has stated it's returning to a more conventional war theme after the cops-and-robbers spin-off *Battlefield Hardline*. With the game due out in late 2016, expect to hear lots more very soon.

Incoming

BioShock was undoubtedly a classic in its own right, but there's

still an understandable amount of affection for its spiritual predecessors – the *System Shock* games. While much has changed in the 16 years since *System Shock 2* came out, both it and the earlier game remain classic mixes of survival horror, RPG and razor-sharp sci-fi storytelling.

If you've been longing for a new entry in the series, there's good news. A studio called OtherSide Entertainment has revealed that it's working on *System Shock 3* – a full sequel rather than the enhanced remake of the original *System Shock* currently being worked on by Night Dive Studios. OtherSide is currently developing *Ultima Ascendant*, which managed to raise \$600,000 in August this year. Will the studio turn to crowdfunding once again for its *System Shock* sequel? We'll have to wait and see. What does seem almost certain is that the scary AI antagonist of the earlier games, SHODAN, will be back once again. "I am flawless, perpetual," *System Shock 3*'s teaser site reads, "absolute..."



▲ "I am flawless, perpetual... absolute." OtherSide Entertainment teases the return of SHODAN in the sequel to the classic *System Shock 2*

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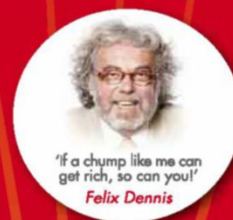
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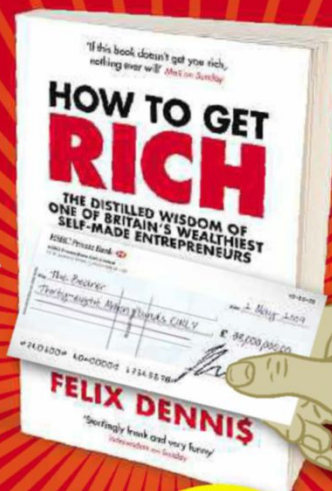
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Windows 720

My mum's ancient laptop gave up, so I grabbed another (via eBay). The old laptop ran Windows XP, but the new one has Windows 7 32-bit.

This change in operating system wasn't a problem until I found her HP DeskJet 720C (good and working) printer has the old 25-pin connector, which the new laptop does not have (of course).

I bought a USB adaptor (PL2305), and trying it on my PC I managed to get it working after some pain, but trying what was apparently the same on her laptop I can't get Windows 7 to go and find a driver. It sees the extra USB device, but I can't get it to find and install the DJ720C driver.

In the old days, the driver would have been quite small and on HP's site. Now HP's site says it's included with Windows 7, but it seems not to be. I can't find anywhere on Microsoft's site to get the driver either.

Help please.

John

With the arrival of Windows 7, many people found that a lot of older hardware software was no longer compatible with the Microsoft OS. Many companies remedied this by releasing updated drivers for the latest OS, but this wasn't always the case, and a lot of end-of-line hardware was discontinued, leaving users out in the cold. Sadly, it looks as though this is the case with the Deskjet 720C, as the HP site lists no Windows 7 drivers, as you've found out yourself.

However, as directed by the HP site, and as found by many users, you can get this printer working by utilising the built-in Windows printer driver. This is usually done in the same manner as adding any hardware, by going to Control Panel and adding new hardware, but just in case, here's how to do it.

First, connect the printer to the computer, powering it up before plugging in the USB cable. Now open the Windows Device Installation Settings and make sure Windows Update is set to automatically download driver software. Do this by searching for 'change device installation'.

Now, search for 'devices' and click Devices and Printers. Click Add a printer and choose the local option. If you're prompted to choose a device or printer to add, select the Deskjet if it's in the list. If it isn't, which is likely, choose the printer not listed option and choose the connection method. Now select the option to use an existing port and click Next. When asked to install the printer driver, select the option to do so via Windows Update, choosing HP. Hopefully, you'll find the printer in the list displayed. If you don't, try looking under Hewlett Packard or even Hewlett-Packard to eliminate all possible naming conventions.



▲ *It's usually an easy task to install a printer, but older models can cause problems*



▲ *Windows' add hardware wizard is notorious for being, how shall we say, poor...*

However, as the printer isn't technically supported by Windows 7, this method is by no means guaranteed, and the above may not work. If you have problems with this, there are other options, which I'll outline here to give you a good shot at getting your mum's printer working.

First, after installing the USB driver as above, you may run into a known problem where Windows, despite having the USB drivers installed, actually tries to utilise the printer via the LPT1 port. This won't work. To fix this, you can try changing the port to USB.

To do so, click the Start orb and go to Devices & Printers. Next, right-click Printer and go to Printer Properties (not Properties). Now go to the Ports tab and select USB001 next to the printer. Once this is done, apply it and give the printer a try. You shouldn't have to reboot, but it can't hurt, just to make sure.

Another possible solution involves downloading a special patch. This is intended to fix various spooler problems, but some have found it useful in actually getting their Deskjets to work too. You can get the patch from bit.ly/1Ujw7po. Before you follow the below instructions, ensure you're logged in as an admin user.

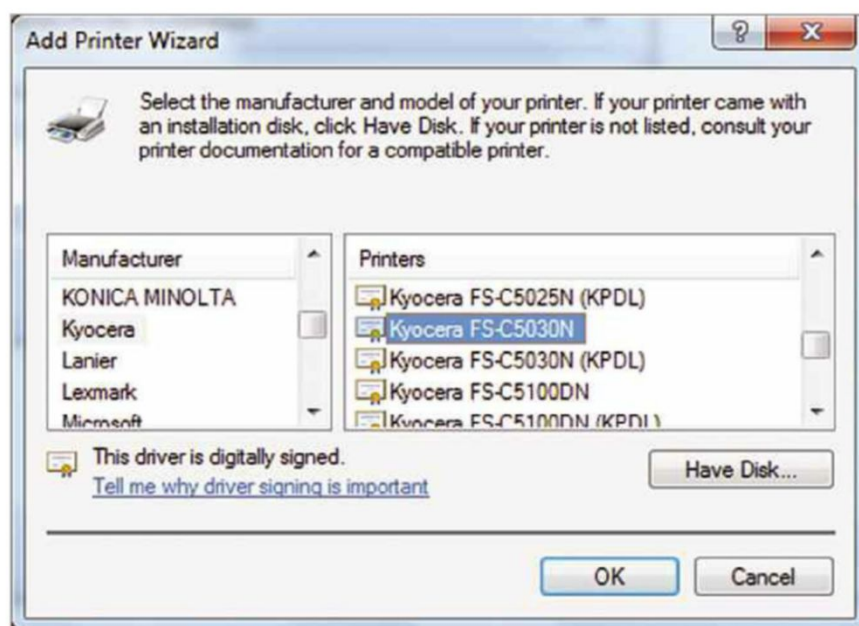
Once you have it, installing it is a little complicated and has to be done in a specific

way, especially on 32-bit versions of Windows 7 and Vista. First, extract the contents of the archive into a new folder. Now, open Explorer and in the address bar type '%windir%\system32\spool\drivers\x64\3'.

Next, open the new folder you just extracted the archive into and copy hpvdb720.dll, hpvdb820.dll and hpwm5db1.dll. Paste them into the '%windir%\system32\spool\drivers\x64\3' folder, selecting the option to overwrite. You could always backup the old files if you wish.

This will replace the printer drivers with patched versions designed to fix various problems, and with a little luck, it should get your printer up and running.

► Often you'll need to explicitly tell Windows what you want to install



Off-board

I have just fitted a new motherboard and CPU to my desktop. The motherboard is an Asus H110M-A D3 and the CPU is an Intel Pentium g4400.

Everything is running okay, but I want to use my Nvidia graphics card in place of the on-board Intel graphics.

The problem is that I cannot find the section in the BIOS that will let me do this. I have read the manual, looked on the internet and I still don't know how to do it.

I would appreciate your help please.

Jim

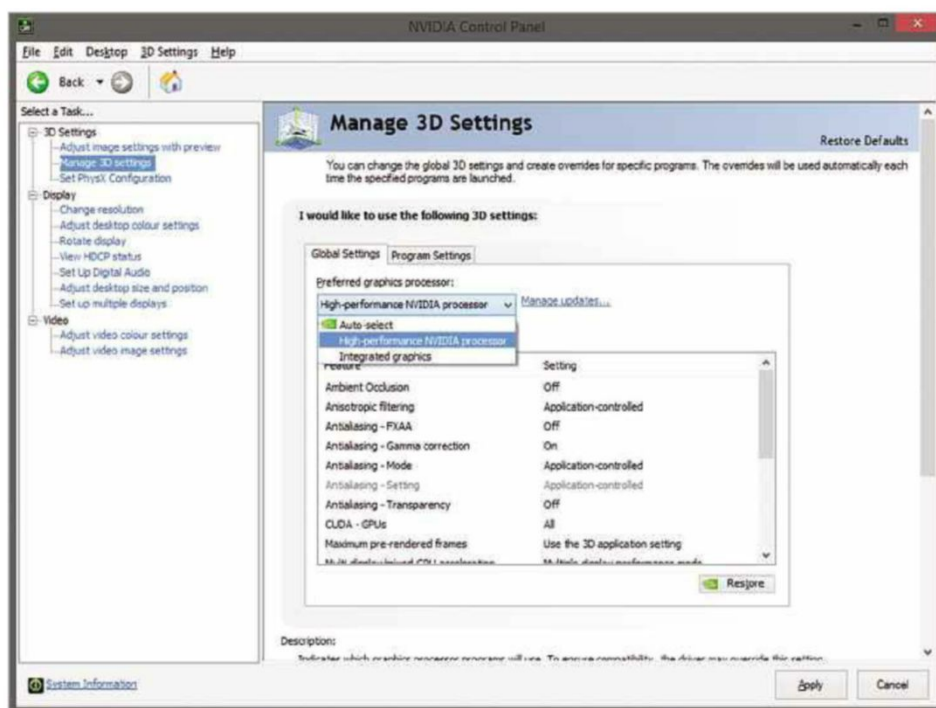
Contrary to popular belief, you don't actually have to disable on-board graphics to use a dedicated video card. In fact, doing so can actually cause more problems should your video card malfunction. Usually, your PC can select between the two, and the drivers can be used to manually do so when running apps. We'll look at this later, though. First, let's look at answering your question.

Asus boards usually have a similar setup, so go into the BIOS as normal and look for the Advanced tab. In here you should see an option called Chipset, and under this Advanced Chipset Settings. Next look for Internal Graphics Mode and change it to disabled. This should deactivate the on-board GPU. Save and exit to check this, after first installing the dedicated GPU, of course.

As I said earlier, you don't actually have to do this, and you can get by with both active. You're using an Nvidia card, so you should have the Nvidia Control Panel installed. When in Windows, go into this and look for the option 'Manage 3D settings' in the left-hand window. Here you can select the different GPUs on your system, including the on-board chip, which is probably an Intel model. You can opt to use the Nvidia chip as the default for all software, or you can specify which GPU

is used on an app-by-app basis. This can be useful for both system resources and power usage conservation, as software like web browsers and email won't really need to use the powerful GPU and can still use the on-board video, while games can make use of the graphics card.

▼ You can use both on-board and graphics card options. Just set this up in your GPU's control panel



ASK JASON



Meet Jason D'Allison, a veteran of Micro Mart's panel of experts. He's here to help with any technical questions, including anything to do with tablets or smartphones, as well as PCs

Send your questions to:
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Contact Jason by email at:
jason@micromart.co.uk

While we try to cover as many questions as we can, we regret that Jason cannot answer your questions personally, but he'll cover as many as he possibly can each week. Please ask one question per letter and remember to include the full specification of your computer, including its operating system.

Jason

Time's Up

I've just bought a used Nokia Lumia 1320. It's virtually mint, but it's still running Windows Phone 8.0, not 8.1. When I go into 'phone update' in Settings and select 'check for updates', I just get this error: "We are currently unable to check for updates." There's also a code: 80072f8f. Wi-fi's working okay, though I don't yet have a SIM, so I can't test 3G or 4G. Is that the problem? Or is there a fault? I don't want to be stuck on an outdated OS – I'm hoping the 1320 will soon get Windows 10 Mobile!

Thomas, Gmail

You've most likely worked this out by now, Tom, and you've probably given yourself a hearty slap, but to help other readers, I'll still give the answer. Basically, error 80072f8f normally shows its face when a phone's date or time is way, way off. If the date and time aren't at least close to being correct, Microsoft's servers will throw a wobbly.

My guess is that you've not set the 1320 up fully yet, or maybe you've inadvertently entered the wrong details. It could also be that you're using the previous owner's configuration (it's usually best to start from a factory reset). Anyway, hop back into

Settings, choose 'date+time', and do the business. I'm sure Windows Phone 8.1 will then come tumbling through the ether.*

Regarding Windows 10 Mobile, it's a case of wait and see. It's finally now launched, being pre-installed on the Lumia 950 and 950 XL, so updates to other Lumias may well have started by the time you read this. The official list of supported models is as follows: 430, 435, 532, 535, 540, 635 (only the 1GB version), 640, 640 XL, 735, 830, and 930.

There's no 1320 there, as you can see. But that list is just the first wave. Windows 10 Mobile for other Lumias will follow in due course, though it's true some models won't receive it at all, despite Microsoft's initial pledge that it would be available on everything capable of

running Windows Phone 8.x. The good news, Tom, is that the 1320 officially supports the Technical Previews, so it's virtually a certainty that the finished article will arrive eventually. As to when, who knows? A wild guess would be mid-march, which is the answer I gave in issue 1391 regarding the (excellent) BLU Win HD LTE.

** While you're there, consider enabling 'Set automatically' if it's currently disabled. This will sync the phone with Microsoft or your network carrier and should ensure the date and time are always correct even if you visit a different time zone. Useful for holidays!*

▼ This error normally appears for one reason and one reason only, so why not tell us what that is instead of showing a silly code?

SETTINGS

phone update

Update status

We are currently unable to check for updates.
(80072f8f)

Ring In The New

For those of you reading this on the day of publication: what are you playing at? Get the party started! And for those of you reading this in 2016: have you recovered from the hangover? You really should know better. Just kidding!

I'm tapping out these words in mid-December, yet it feels more like September. It's a little after 6am, and I've just picked up my lad from work – in sandals and a T-shirt. It's 14°C! They don't make winter the way they used to, that's for sure. When I were a lad...

Anyway, my friends, happy new year! My very best wishes to each and every one of you. I hope the coming months are happy and healthy. Follow your dreams; don't leave it too late. Be kind. Don't fret over what others are doing or how much they're earning; it really doesn't matter. Be positive. Switch off the telly (or Facebook!) and read a book instead or meet up with some chums.

And keep supporting Micro Mart! Thank you, dear readers, for putting up with the rubbish I serve up every week. It means a lot. Here's to a fantabulously geeky and gadgety 2016!

Nefarious Network?

I recently detected a Raspberry Pi illegally connected to our home network. If I now plug a PC into the mains – not the internet – the hard drive becomes corrupted. I've bought two refurbished HPs to experiment with Linux on, but because of this I can't use them. I can't use the internet either.

Over the last few weeks, we've had lots of trouble with our heating, cooker, microwave, TV, landline phone, and so on. Is it possible, therefore, for a Raspberry Pi to manipulate another property's electrical system? I have to ask, as I believe this is what's happening.

Paul Monk, Warwickshire

No, it's not possible for a Raspberry Pi or any other device to manipulate a home electrical system. In fact, there's nothing to manipulate, as mains power enters a house through 'dumb' transformers and a 'dumb' consumer unit (fuse box). There are no programmable electronics (except for maybe a smart meter).

Some home-automation setups use mains wiring to transmit the control signals, but even there, manipulation is limited to switching appliances on and off and altering basic settings. Also, the appliances have to be

'aware'. Furthermore, signals originating from outside the host electrical system would be killed at the consumer unit (usually!).

Of course, mains wiring can also be used to create a network – HomePlug adaptors and all of that. Even if such a network were hacked, though, only the connected computers or other programmable devices would be open to abuse. 'Dumb' white goods would be immune. Also, a HomePlug-type network can only really be hacked if there's wi-fi in the mix or if someone's drilled through a wall and tapped directly into the wiring. It's not possible to connect via the wiring of a neighbouring property (again, usually!), as once more the signals would be killed at the consumer unit.

In short, Paul, you're adding 1 and 1 together and coming up with 666. Any electrical problems you're having are pure coincidence. It sounds as though you've got a wi-fi network and a neighbour has taken advantage of a weak password. If there's no password at all, the neighbour may even have connected accidentally – I've done this myself. Aside from the obvious security concerns, there's no harm. Change the password or add one and carry on as before.

I'm unsure what you mean when you say that hard drives are becoming corrupted.

Has this happened more than once, ruling out simple random failure or a faulty cable or motherboard? If so, I'd say it ties in with the other issues – get an electrician to look at your mains wiring. A power spike can certainly damage a hard drive (or destroy it), though I can't imagine how it could alter the 0s and 1s on the platters. If the controller became partially fried, I suppose data might be read wrongly, which would produce the same end result as corruption.

PS – I reckon you might be pulling my leg with this, Paul, but nonetheless I've elected to answer it straight.

▼ *Is there nothing the Raspberry Pi can't do?*



On The Menu

When I right-click the Start button in Windows 10 to open the Quick Access or power-user menu, any selection I make causes the screen to go black. Half a second later, my desktop picture will reappear, and after another half a second the icons will follow. All's then normal.

The only selection that works is Search, but afterwards the Start button ceases to function at all; it'll turn blue if I move the mouse pointer over it, but left and right clicks will do nothing. I have to reboot.

This first started to happen in October, right after I upgraded from Windows 7. However, once I'd installed the big November update, the problem went away – until today! Any ideas?

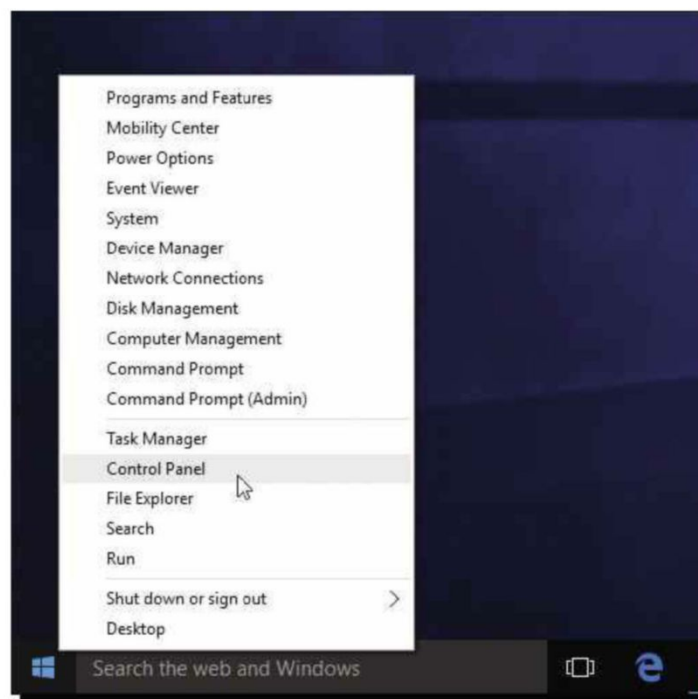
John van Someren, via email

This is utterly bizarre, and initially I felt sure faulty hardware – probably RAM – was to blame. Looking online, though, I see that many other users are experiencing the same problem, or at least something similar.

It seems the usual culprit is a program that isn't fully Windows-10-compatible. The main candidates are Apple's iCloud software, ADT Audio (for ADT-based sound cards) and anything from Norton (Symantec). There's a fix for Norton users: download the tool at goo.gl/ySzpYJ. For the other programs, the only option at present is to install the newest versions and cross your fingers. Or uninstall them.

If you're not running any of the above, John, fire up Windows 10's 'Uninstall a program' utility via Control Panel and uninstall pretty much everything one by one until you find the troublemaker. I appreciate that this could be a long process! And if that doesn't help, please write back in with as much detail as possible and I'll try again.

▼ *I mention Windows 10's 'power user' menu a lot, but what can you do if it simply doesn't work?*



Crowdfunding Corner

It's the end of the year, but that doesn't mean Kickstarter has dried up. Crowdfunding happens all year round, and maybe in a week or two you'll have some Christmas money left over to spend on these...

PINE A64 Miniature 64-bit Computer

Small single-board computers like the Raspberry Pi and Arduino have become a hobbyist sensation, so we expect similar things of the Pine A64, which is the same kind of system but with one important extra: added power.

Based on an ARM A53 64-bit processor, the A64 runs at 1.2GHz and packs in a MALI-400 MP2 GPU, meaning that its graphical capabilities are slightly higher than the original Xbox. Performance overall is around 30% better than its 32-bit counterparts, and the initial buy-in is a lot less because many of the modules are purchased separately.

The default board has two USB ports, HDMI and 3.5mm ports, an Ethernet port and two IO buses. Additional modules you can buy include a camera, touch panel and LCD panel. By attaching a keyboard and monitor, you can even turn it into a fully functional Android-based desktop computer!

Although there are some early bird tiers available, the cheapest non-limited package is the standard Pine A64 (\$15/£10), which gets you the CPU/GPU board and 512MB of SDRAM, with shipping to start in April 2016. But we'd recommend going for the Pine A64+ (\$19/£13), which gets you 1GB of RAM for just a few quid more. The project has already obliterated its initial target by more than ten times, even with over a month still left on the clock, so we're confident it's got the popularity to keep going.

URL: kck.st/10kfeG6

Funding Ends: Saturday, 23rd January 2016

Enlaps Tikee Time Lapse Photography Solution

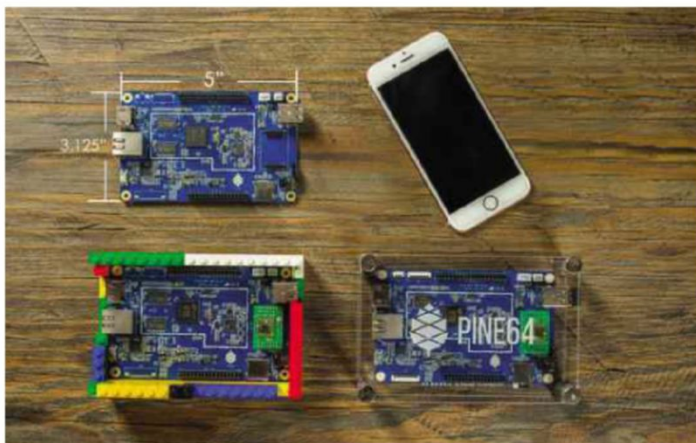
Time lapse photography can produce amazing images, but it's usually beyond all but the most dedicated and professional photographers. The Enlaps Tikee isn't cheap, but if successful, it should put time lapse photography that little bit closer to all of our reaches.

The Enlaps Tikee is a complete plug-and-play timelapse solution, which uses a photovoltaic solar cell to avoid the problem of battery drain, and instant cloud storage to prevent its memory from filling up. The casing is IP54 waterproof for outdoor use, and its dual lenses allow for a full panoramic view. There's even a built-in anti-theft system and connected web apps so you can be sure it won't get stolen, and that you can locate it if it's lost or moved.

The cheapest tier for the Enlaps Tikee is 349 (£250), which is costly but still more than 250 (£180) off the retail price. There are further tiers available with slightly less discounted, but they're all limited, so the quicker you back, the more you'll save. The project is only 20% towards its goal, but with a month left on the clock, we're fairly sure it's going to hit it!

URL: kck.st/1RmeiY0

Funding Ends: Tuesday, 19th January 2016



Disclaimer: Images shown may be prototypes and Micro Mart does not formally endorse or guarantee any of the projects listed. Back them at your own risk!

App Of The Week

Format Factory

Is converting one file type to another becoming a bit of a pain? A solution is at hand

Although this digital age has brought us many wonders, such as realistic graphics, high definition, lossless audio and the ability to view our pictures on the go, it's also caused us no end of headaches, especially when it comes to file formats.

How many times have you emailed or handed over a file to a friend that won't open on their computer or mobile device? How many times have you tried to open a file that works perfectly fine on your PC but refuses to be recognised on your tablet?

It's a bit of a pain, and thanks to the hundreds of different picture, video and audio file formats already available, we now have to make sure that the file we want to transfer is compatible with multiple systems and platforms.

FileFactory

We recently came across FileFactory, a little-known program that can convert audio, video and picture files from one file format to another in a matter of seconds. In addition to the standard conversions,

you can also convert DVDs to a range of video files, music CDs to audio files, DVD or CD to .iso or .cso and .iso to CSO and vice versa.

You can join videos of different formats and save them as a single, different format. The same with audio, and you can mix audio and video together and batch rename all media files within a folder.

Of course, there's also a special set of options for mobile devices, which include the default media file types as well as specific Android, iOS, Sony PSP and PS3, Microsoft and Nokia settings that can be tweaked and saved as profiles.

Installation of FileFactory is simple enough and can be found at goo.gl/vv5adR. All you need to do is follow the on-screen prompt, make sure to untick the option for the Ask bar and decline the extra installation of the Speed My PC Up software (or whatever it's called). Indeed, sadly, there is crapware with this particular program.

Once installed, just execute it, choose the file type you want to end up with and point the Explorer browser to the files you want converting.

Features At A Glance

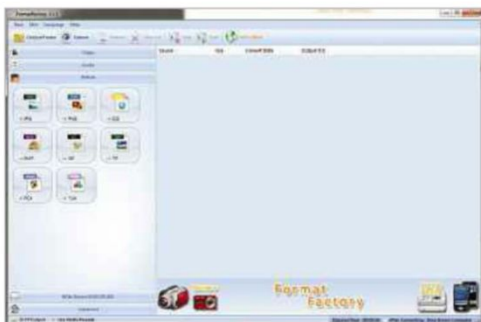
- Free
- All to MP4/3GP/MPG/AVI/WMV/FLV/SWF.
- All to MP3/WMA/AMR/OGG/AAC/WAV.
- All to JPG/BMP/PNG/TIF/ICO/GIF/TGA.
- Rip DVD to video file, rip Music CD to audio file.
- MP4 files support iPod/iPhone/PSP/BlackBerry format.
- Supports RMVB, watermark, AV mux.

Your choices will be added to the list in the main screen, and all you have to do then is click on the 'Start' button from the top bar menu, and away you go.

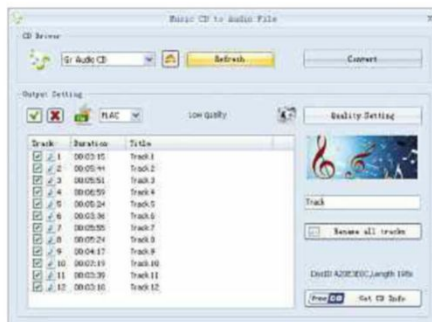
Conclusion

Aside from the Ask bar and the extra Speed My PC software, FileFactory is one of the best all-round conversion tools we've used in a long while. It's quick, can convert more file types that we can possibly mention here and can do all sorts of things with media files for mobile platforms. What's more, the conversion process doesn't drastically alter the quality of the picture, audio or video files, so those high-resolutions images you took will still retain their quality even after being converted to some obscure file format for your relative with the bizarre operating system.

All in all, it's a really handy tool and one that's likely to remain installed on our work PC for some time to come.



▲ FormatFactory is fantastic at converting media files from one type to another



▲ You can rip music, DVD and convert without loss of quality

Logging Off

Have you ever picked up a storage product and read the packaging? It might seem pedantic, but it's part of my job to do this so I can see what makers are claiming about their devices.

And here's a shock: most of what they put on there is utter rubbish, designed to befuddle those who never mastered recording on VHS. No, it really is.

My first bone of contention is that they put the specification of USB on there, like that SuperSpeed USB 3.0 theoretical cap of 4.8Gbps has anything to do with how fast the actual device is. One maker even claimed that USB 3.0 delivers the maximum performance for transferring files, forgetting that the same drive could be connected by SATA and deliver either the same or even better speed.

But when they've done wielding the speed of a technology they've used, which they can't hope to even deliver a fraction of with disk technology, they then move on to abusing the concept of capacity.

Obviously, in many marketing meetings, the hot potato of a 'terabyte' got kicked into the long grass before the first cup of coffee was tepid.

Instead, we're presented with entirely ludicrous lists of what the drive might contain, like all pictures, music and videos come in one-size-fits all file formats. Accord to one drive maker, 2TB is enough for 2,000 hours of video, 380,000 MP3s, 4,000,000 photos and 2,800 Divx movies. Really?

That's odd, because another fits 241 hours of video, 500,000 MP3s, 400,000 photos and 123 Divx movies in exactly the same amount of capacity. Plus-sized bytes anyone?

The issue could be that as files aren't the same size, and a photo might range from 500KB up to 50MB or more as a TIFF, so such information is entirely speculative and probably entirely misleading.

I'm also curious what would happen if you actually put four million pictures on a 2TB drive in the same folder, because I suspect it might break the file system. That said, I'm not so keen that I'd actually spend the time to test that assertion.

There seems like some unnatural compunction to avoid just telling us that it has 2TB of capacity, like that's somehow the wrong information.

It's not like shops sell you a one-litre carton of milk and tell you it's enough for 128 cups of tea, 34 skinny lattes or one rice pudding.

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Obviously, that would be silly, on par with those who insist on putting 'this product may contain nuts' on a bag of mixed nuts.

Using quick mental arithmetic, I can work out that my house contains roughly 800m² air. Is that lots? Well, it's only a relevant question if I was sealed into it and wanted to know how long I'd live off that total capacity. (Actually, you'd die of carbon dioxide poisoning (hypercapnia) long before you exhausted all the oxygen, in case you wondered.)

Surely the point of a storage device is to contain what you've got, until it's full, and then you buy something extra or bigger? If I knew now how much storage I'd need, then that would be wonderful, but possibly supernatural.

Why that appears to be such a difficult concept to grasp and communicate is a mystery, much like the thought processes in Donald Trump's head.

Mark Pickavance

LAST WEEK'S CROSSWORD

Across: 7 Cosmographers, 8 Geddit, 9 Derate, 10 Caveats, 12 Lynch, 14 Étude, 16 Missile, 19 Emojis, 20 Repeal, 22 Stenographers.

Down: 1 Sole, 2 Smudge, 3 Agitate, 4 Dandy, 5 Thirty, 6 Critical, 11 Automate, 13 Diurnal, 15 Dejunk, 17 Sappho, 18 V-Sign, 21 Acre.

DISCLAIMER

The views expressed by contributors are not necessarily those of the publishers. Every care is taken to ensure that the contents of the magazine are accurate but the publishers cannot accept responsibility for errors. While reasonable care is taken when accepting advertisements, the publishers cannot accept any responsibility for any resulting unsatisfactory transactions. How many of you got a ninja sword for Christmas? We're willing to bet not that many. We did, though. Well, sort of. What we actually received was an umbrella made to look like a ninja sword. It's actually quite a good umbrella, and it's only the handle that looks like a ninja sword – although it also comes with a slip case with a strap so you can

mount it on your back (like a ninja sword). In use, it just looks like an umbrella with a weird handle, but on your back it really does look like you're walking around with a weapon. Maybe we're being paranoid, but we can't help but see how this could all go terribly, terribly wrong, so we're not sure we actually want to use it. It's okay for strutting around at home, of course, but there doesn't tend to be a lot rain indoors. Anyway, what else have we been up to? Dressing up as Santa, for a start, in preparation for a pub crawl that involves dressing up as Santa. Oh, and also some drinking, but we're mainly going for the white beards and red trousers. By the time you read this, though, Christmas will have already been and gone. Hope you all had a good one!

USB Capacity Chart

| Verbatim | 2GB | 4GB | 8GB | 16GB | 32GB | 64GB |
|-------------------|-----|-------|-------|-------|--------|--------|
| Video (H264, M4V) | 30 | 60 | 120 | 240 | 480 | 960 |
| Photos (JPG, PNG) | 650 | 1,300 | 2,600 | 5,200 | 10,400 | 20,800 |
| Songs (MP3) | 500 | 1,000 | 2,000 | 4,000 | 8,000 | 16,000 |

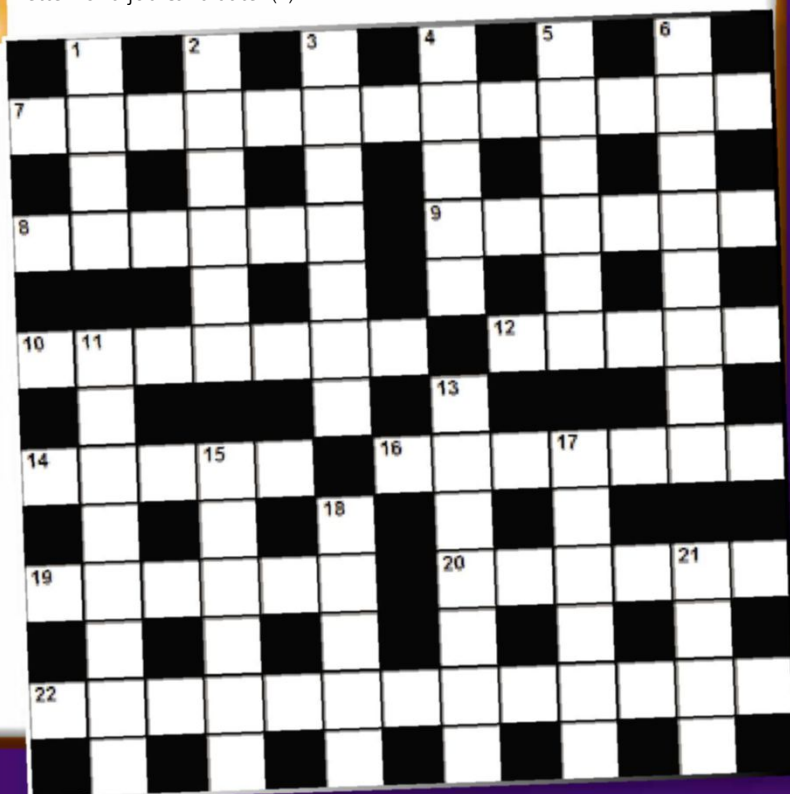
THIS WEEK'S CROSSWORD

Across

- 7 Theresa May's day job? (4,9)
 8 Base a concept on an extension or modification of another concept. (6)
 9 A small being, human in form, playful and having magical powers. (6)
 10 A deprecated set of technologies developed by Microsoft that allow software components to interact with each other in a networked environment. (7)
 12 Memory that is set aside as a specialised buffer storage. (5)
 14 A small cavity in rock lined with crystals or other mineral matter. (5)
 16 Having a constant ratio. (3,4)
 19 A person doing work that is poorly paid and considered menial. (6)
 20 An instance of misfortune. (6)
 22 A four-sided figure. (13)

Down

- 1 Either of the two points at which the axis of a circle cuts the surface of a sphere. (4)
 2 A zodiacal constellation in the northern hemisphere between Taurus and Cancer on the ecliptic. (6)
 3 Someone who writes a reference letter for a job candidate. (7)
 4 A spring-loaded electrical contact between the stationary and rotating parts of a machine. (5)
 5 The thickened ventral plates on each segment of the body of an arthropod. (6)
 6 A musical note having the time value of a quarter of a whole note. (8)
 11 A digit representing the sum of the correct digits in a piece of digital data, against which later comparisons can be made to detect errors in the data. (8)
 13 The branch of linguistics that deals with syntax and morphology. (7)
 15 Separate into parts or portions. (6)
 17 The rectangular formation of parallel scanning lines that guide the electron beam on a television screen or a computer monitor. (6)
 18 A member of a group of ancient Greek philosophers who advocated the doctrine that virtue is the only good and that the essence of virtue is self control. (5)
 21 A set of web development techniques utilising many web technologies used on the client-side to create asynchronous web applications. (4)



In Next Week's Micro Mart*

- What plans does Microsoft have for Windows in 2016?
- The essential guide to the Linux command line
- The top ten reasons to stick with Windows 7
- Plus the usual mix of news, reviews and advice



* May be subject to change

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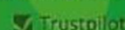
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